

THE
FERN BULLETIN,

A Quarterly Devoted to Ferns.

EDITED BY WILLARD N. CLUTE.

VOLUME VII.

LIBRARY
NEW YORK
BOTANICAL
GARDEN.

BINGHAMTON, N. Y.
THE FERN BULLETIN CO.
1893.

XF

E761

V. 7-9

1899-1901

CONTENTS.

	PAGE.
A Correction.....	27
A Correction— <i>B. D. Gilbert</i>	41
A Bryological Memorial Meeting at Columbus, Ohio.....	77
Adaptability of Ferns to Light— <i>C. E. Waters</i>	8
<i>Adiantum Capillus-veneris</i> in Dakota— <i>C. E. Bessey</i>	14
A Fern New to the United States— <i>B. D. Gilbert</i>	10
A New Locality for <i>Asplenium pinnatifidum</i> — <i>Wm. Palmer</i>	70
A New Species of <i>Botrychium</i> — <i>A. A. Eaton</i>	7
A New Species of <i>Selaginella</i> — <i>A. A. Eaton</i>	33
An Extension of Range for <i>Woodwardia radicans</i> — <i>J. B. Flett</i>	9
An Illustrated Glossary of Bryological Terms— <i>A. J. Grout</i> , 82, 110	
<i>Asplenium ebenoides</i> —A correction— <i>L. M. Underwood</i>	95
A Suggestion for Study— <i>B. D. Gilbert</i>	37
A Variety of <i>Dicksonia</i> — <i>William R. Maxon</i>	63
Book News.....	18, 47, 74, 102
Cryptogramme acrostichoides— <i>J. B. Flett</i>	36
Distribution of the Rue Spleenwort in Ohio— <i>W. A. Kellerman</i>	96
<i>Dryopteris cristata</i> × <i>marginalis</i> — <i>Miss Margaret Slosson</i>	5
<i>Dryopteris Noveboracensis</i> without Indusium— <i>B. D. Gilbert</i>	3
<i>Dryopteris simulata</i> in New York State— <i>Willard N. Clute</i>	91
Editorial.....	16, 43, 72, 100
Extension of Range for <i>Asplenium viride</i>	37
Fairy Rings formed by <i>Lycopodium inundatum</i> — <i>B. L. Robinson</i> ..	68
Ferns Out of Place— <i>Willard N. Clute</i>	95
Fern Stems— <i>C. E. Waters</i>	92
Fern Variation— <i>J. Warren Huntington</i> , <i>A. A. Eaton</i>	12
Geographical Distribution of <i>Dicrana</i> — <i>Rodney H. True</i> ..	25
<i>Grimmia mollis</i> in the United States— <i>John M. Holzinger</i>	27
Heater for Glycerine Jelly Slides— <i>J. Franklin Collins</i>	21
How to Identify the Shield Ferns— <i>Willard N. Clute</i>	61
Key to the Mniums of Northeastern America— <i>A. J. Grout</i> ..	105
<i>Lycopodium alopecuroides</i> — <i>George E. Davenport</i>	97
Mosses for Distribution.....	27, 55, 81, 112
New American Mosses.....	84

	PAGE.
Notes.....	17, 45, 73, 102
Notes on Some South Florida Ferns— <i>Charles Louis Pollard</i>	88
Noteworthy American Mosses.....	80
Our Miscellany.....	15, 42, 99
Preparation of Mosses for Examination with the Compound Microscope— <i>A. J. Grout</i>	49
Sensitiveness of Ferns to Environment— <i>G. A. Woolson</i>	13
Some Additional Notes on the Methods of Microscopical Ex- amination of Mosses— <i>John M. Holzinger</i>	107
Some Rare Vermont Ferns— <i>Willard W. Eggleston</i>	4
Some Variations in the Adder's-tongue— <i>William R. Maxon</i>	90
The Bryologist.....	21, 49, 77, 105
The Birth of a Fern— <i>Chas. T. Drury</i>	39
The Boulder Fern, or Fine-Haired Mountain Fern— <i>William R. Maxon</i>	94
The Cord-moss and Its Allies— <i>A. J. Grout</i>	52
The Dicranums—II— <i>A. J. Grout</i>	23
The Field Horse-tail— <i>C. F. Saunders</i>	31
The Genus Equisetum with Reference to the North American Species— <i>A. A. Eaton</i>	57, 85
The Linnæan Fern Chapter.....	19, 48, 76, 104
The Mniums— <i>A. J. Grout</i>	78
The Ostrich Fern in Virginia— <i>Charles Louis Pollard</i>	71
The Pteridophytes of Georgia— <i>Roland M. Harper</i>	65
The Sequence of the Cinnamon Fern's Fronds— <i>W. N. Clute</i>	97
The Spore-bearing Area of Fertile Fronds— <i>B. D. Halsted</i> ..	69
The Sullivant Moss Chapter.....	28, 56, 112
The Tennessee Locality for the Hart's-tongue Fern— <i>James H. Ferriss</i>	98
The Turkey-foot Fern.....	11
The Turkey-foot Fern Again— <i>James A. Graves, Mrs. Stephen Knowlton</i>	39
Trichomanes peltatum in Japan— <i>K. Miyake</i>	59
Tubers of Nephrolepis— <i>J. Birkenhead</i>	35
Tubers of Nephrolepis— <i>Mrs. J. M. Milligan</i>	12
Variation in Polypodium vulgare— <i>Mrs. E. G. Britton</i>	34
Veining in the Marsh Shield-fern and Others— <i>W. N. Clute</i>	67
What are Mosses— <i>A. J. Grout and Marie L. Sanial</i>	51
Wyoming Pteridophytes— <i>Elias Nelson</i>	29
Young Hart's-tongues at Green Lake— <i>Will. R. Maxon</i>	1

50 cts. per Year
15 cts. per Copy.

Vol VII.

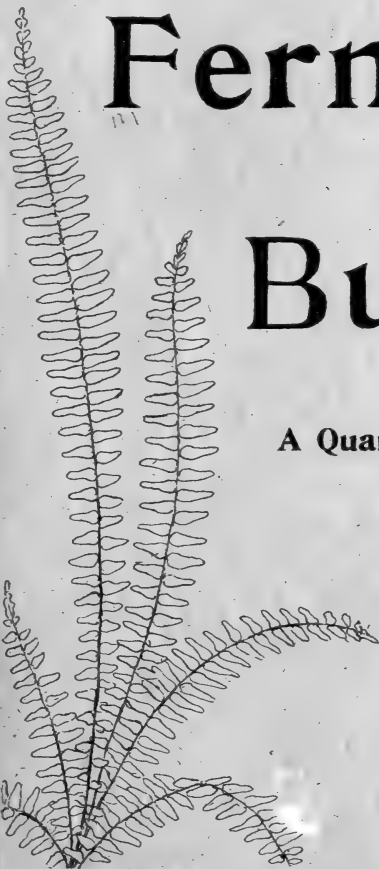
No. 1.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

JANUARY.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1899.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

Articles pertaining to any phase of Fern life solicited.

Communications intended for the editor should be addressed to Willard N. Clute, New York Botanical Gardens, Bronx Park, New York City.

15 CENTS A COPY; 50 CENTS A YEAR.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter

THE LINNAEAN FERN CHAPTER.

PRESIDENT, A. A. EATON, SEABROOK, N. H.

Secretary, W. R. MAXON, N. Y. Botanical Garden, Bronx Park, N. Y. City.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

THE SULLIVANT MOSS CHAPTER.

PRESIDENT, A. J. GROUT, PLYMOUTH, N. H.

Secretary, MRS. ANNIE MORRILL SMITH, 78 Orange St, Brooklyn, N. Y.

Moss students are invited to become members of the Chapter. Address the officers for further information.

WANTS AND EXCHANGES.

Special announcements inserted here, for One Cent a word. No notice received for less than 25c. No charge for address. Mail all notices to the Binghamton, N. Y., office.

WANTED—Copy of Williamson's "Ferns of Kentucky." in good condition. Address The Fern Bulletin, Binghamton, N. Y.

I WISH to obtain No. 3, Vol. 1, Linnæan Fern Bulletin, also No. 1, Vol. 4. Am willing to pay a reasonable price for them. Address B. D. Gilbert, Clayville, N. Y.

WANTED—To exchange *Hylocomium squarrosum* or *Buxbaumia aphyllus*, for specimens of the rarer *Hypnum*s. J. W. Huntington, Amesbury, Mass.

IMPORTANT NOTICE.

We desire to announce that owing to the improvements made in the current volume of The FERN BULLETIN, the price of sample copies will now be fifteen cents each. Purchasers of sample copies may deduct this amount from the regular subscription price when subscribing. THE FERN BULLETIN CO.

THE FERN BULLETIN

VOL. VII.

JANUARY, 1899.

No. 1.

YOUNG HART'S-TONGUES AT GREEN LAKE.

BY WILL R. MAXON.

LIBRARY
NEW YORK
BOTANICAL
GARDEN

MY interest in the rare Hart's-tongue fern (*Phyllitis scolopendrium*), was much increased some time ago by the discovery of great numbers of prothalli and of plants in all the younger stages of growth at Green Lake, two miles east of Jamesville, N. Y. This locality is both interesting and picturesque. The lake, less than a mile in circumference, is walled about on three sides by precipitous cliffs that tower above it two hundred feet and more, but bordered on its fourth or north side by a low-lying meadow. It thus appears very like a great harbor. The surrounding cliff, together with its talus which is so extensive that it forms a steep slope from near the top almost to the water's edge, forms a great U. The greater portion is sparsely wooded with cedars, basswoods, beeches and scraggly sumacs; but near the base of the U, the steep slope seems some time to have been cleared of forest growth, and here, strangely enough, the Hart's-tongue grows, well up on the cliff and invariably in the debris of the corniferous limestone.

This station is the most exposed of any in central New York. The mature plants deprived of shade seem to have deteriorated for they have turned an unusual light green and are rather undersized, frond and stipe rarely measuring more than a foot in length. But prothalli and young plants occur in abundance and thrive despite the absolute dearth of protective covering and the consequent severe exposure in both summer and winter. Their place of growth, however, stands them in good stead. The rock fragments are coarse and roughly jagged and lie loosely protruding over one another, their interstices making any number of miniature caves wherein our young Hart's-tongues may grow. Here, away from the light, and always on the damp film of rich, black soil which everywhere coats the rocks when they have lain undisturbed for a time, prothalli and young plants grow in more abundance.

The prothalli, unusually thin and fragile in texture, are dark green. Generally their shape is squarish rather than cordate or

SOME RARE VERMONT FERNS.

BY WILLARD W. EGGLESTON.

VERMONT is a good field for the fern enthusiast, for we have a number of rare ones and are still finding more. *Woodsia glabella*, the plant which started C. G. Pringle in his botanical wanderings, and was found by him on a number of mountains in northern Vermont, has also been discovered by F. A. Balch in Queechee Gulf in central-eastern Vermont, at an altitude of not over 600 feet. This locality must be something similar to the Little Falls, N. Y., situation, where it was first found by Dr. Vasey.

One of the rarest ferns in the east, *Asplenium trichomanes incisum*, has been found in Norwich by Prof. H. G. Jessup. *Dryopteris fragrans* was found by the writer in Underhill Notch in 1894; but the greatest surprise he has had in the fern line was the discovery, in company with G. H. Ross, in July, 1898, of this fern in Hubbardton, in the Tacomie range of mountains, at an elevation of not over 1,200 feet. The Tacomie range is the range in Vermont west of the Green mountains, the particular locality, in fact, in which southern and western plants extend much farther north and east—just the last place to expect Arctic or boreal plants.

In August last Ross brought in a Rutland specimen of *Asplenium ebenoides*. This fern has been found but once before, I believe, in New England (in Connecticut), many years ago. In the Rutland locality there was but one plant with the usual accompaniment of *Asplenium platyneuron* and *Camptosorus rhizophyllus*.

Last year was a particularly favorable year for rock ferns. The writer found more of that extremely rare fern, *Woodsia alpina*, in Smuggler's Notch, Mt. Mansfield, than he had ever seen before, simply because it had a chance for growth in dry places, its best location. In North Pownal he found *Pellaea atropurpurea*, twenty inches high, and lots of *Asplenium Ruta-muraria*. These last two are quite common in western Vermont, although local. In the rock cut of the Rutland Railroad in Mt. Holly we saw this year quantities of *Pellaea Stelleri*, four or five inches high.

Vermont has had one station for *Woodwardia Virginica* since Dr. J. W. Robbins found it at Colchester Pond in 1829. This year it has been found at a pond in Randolph, in eastern Vermont.

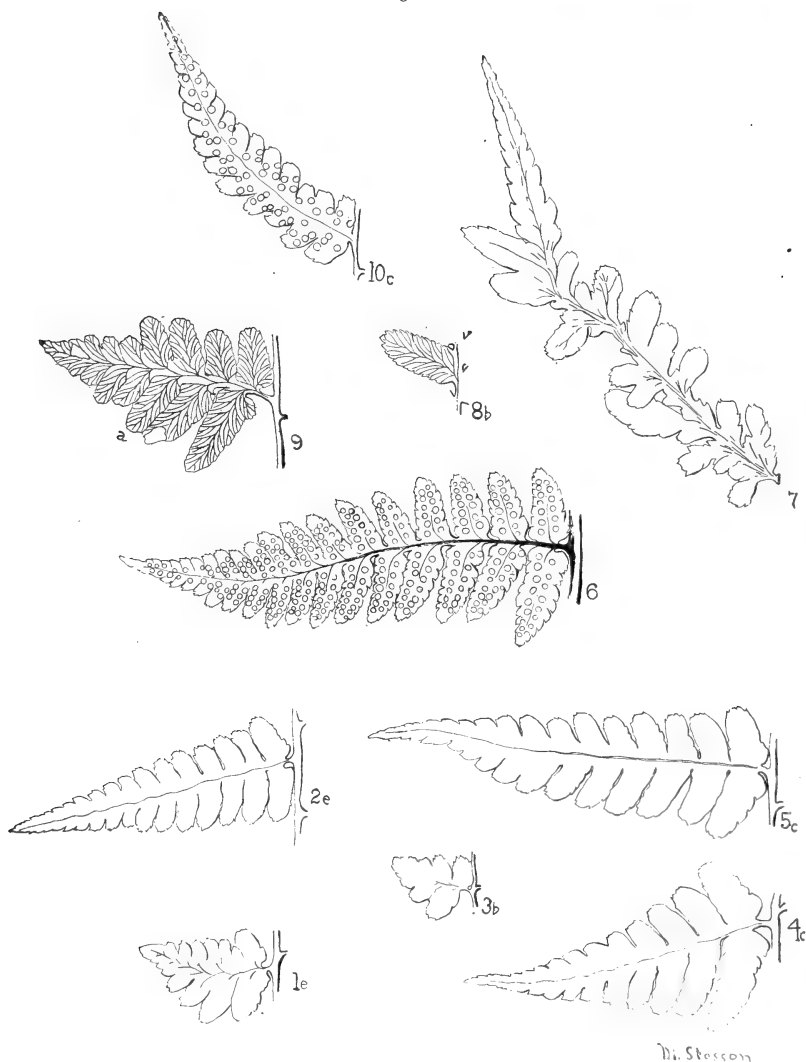
Miss M. Slosson and the writer have found stations for *Dryopteris cristata* × *marginalis*, and if we can find *Dryopteris simulata* we shall be about satisfied. As it is, we have forty-seven species and varieties of ferns in the State, as many as the other five New England States together. To this might be added twelve more for *Botrychium* and *Ophioglossum*.

Rutland, Vt.

DRYOPTERIS CRISTATA × MARGINALIS.

NEAR the central part of Vermont the Green Mountains and a range locally known as the Western Hills run parallel for some little distance. The country between is very hilly. To the east the valley dips, and extending for perhaps half a mile between densely wooded hills rising abruptly on either side, forms a woodland swamp. The trees in the swamp are mostly tamaracks, while under foot beds of sphagnum, saturated with water from the underlying bog, make the swamp almost impassable. There, also, usually half imbedded in some crumbling log, grows *Dryopteris cristata* × *marginalis*. At first sight this fern suggests *cristata*; looking more closely, one sees a difference. The more heavily fruited of the fronds have something of the erectness and rigidity of *cristata*, but the pinnæ of many of the fronds droop a little with a slight upward curve, the color of the fronds is more blue, the growth of the rootstock is terminal and the fronds form a circle around the curled-up buds. In *cristata* the growth of the rootstock is lateral and the buds push out sideways beyond the fronds.

I find the rootstock often producing buds in the axils of the old stipe bases. These buds develop into young plants, and as each has its central terminal crown, which grows straight upward, the resulting effect is a crowded cluster of plants of all sizes with their rootstocks firmly welded together. The fronds of all the young plants of this fern vary from triangular to ovate in outline, but the fronds of the young plants derived from axillary buds of rootstocks seem older from the beginning, than the fronds of young plants springing directly from spores; they have more often the long, acuminate pinnæ that in the latter are seldom seen until a much later period. The fronds of these offsets also sometimes develop their lower pair of pinnæ much at the expense of the rest of the frond. This is not due to any injury, so far as I can see.



Dr. Stearns

PINNAE OF *DRYOPTERIS CRISTATA* X *MARGINALIS*.

Figs. 1, 3, 4, 9, basal pinnae. Figs. 2, 5, 6, 7, 8, 10, upper pinnae. Pinnae lettered alike are taken from the same frond.

The pinnules never become much pointed. In the younger fronds they are short, and rounded or blunt, their margins entire or finely toothed, either all around or at the ends only. Later the pinnules grow longer and narrower and the teeth become lobes, in their turn toothed. The pinnules, especially in very large fronds, are frequently irregular, pinnules little more than curves alternating with others several times their length, giving the whole frond a curiously distorted appearance. Sometimes entire clumps are affected. When the plants grow older and the pinnules grow longer and become lobed, each small lobe is very like a pinna of the first fronds starting from the prothallus. The fern thus, in a way, repeats the primary segments of the earlier fronds in the secondary and ultimate segments of the later.

The general outline of the fronds of this fern and of the fronds of *D. Boottii* are frequently very similar, and the two ferns at a short distance often bear a striking resemblance to one another, but on closer inspection the likeness vanishes. There is not much danger of confusing *cristata* \times *marginalis* with *marginalis*. I do not know whether *cristata* \times *marginalis* really approaches *cristata* more nearly than it does *marginalis*, or whether the difference between it and *marginalis* is of a kind more readily seen than the difference between it and *cristata*, but there is certainly some times difficulty in distinguishing between the two latter. *Cristata*, like *cristata* \times *marginalis*, is very variable, and there is apparently a perfect transition through intermediate forms from one to the other; I am not sure that there is a transition in reality.

The known stations for *cristata* \times *marginalis* are New London, Conn.; Boxford, Newbury, Merrimac and Medford, Mass.; Warren, R. I.; Pittsford, East Peak and Chittenden, Vt.; Hampton Falls, N. H.; Summit, N. J., and Dover, Me.—*Abridged from an article by Margaret Slosson in the Plant World.*

A NEW SPECIES OF BOTRYCHUM.

BY A. A. EATON.

AT the meeting of the Chapter at Boston, I described and exhibited specimens of a small Botrychium found growing in deep shade in maple swamps. So large a series of specimens exhibiting the same characters without sensibly intergrading with any other species was convincing evidence to most present that its claim to specific rank was unquestionable, which view

had been held by me almost from its discovery four years ago. From its habit of growing only in places so shady that other plants do not thrive, I propose to name it as follows:

BOTRYCHIUM TENEBROSUM n. sp. *Height*, 1-9 inches, averaging 4 or 5 inches, one-third of which is below ground; slender, not fleshy, light green or yellowish after fruiting, transparent when dry; *vernation* as in *B. lunaria*; sterile lamina above the middle, often immediately under the fertile, short-petioled, simple, lobed or usually with 1-3 pairs of distant; alternate, lunate, decurrent, entire segments; *apex*, emarginate or with a triangular elongation of the rachis. Fertile division usually short-stalked, simple, or rarely with one or two short branches, somewhat dilated, bearing alternate or nearly opposite clusters of sporangia on the sides, *spores*, very large, verrucose. *Habitat*, rich shady situations, usually among maples at the border of swamps; common in Rockingham County, N. H., and Essex County, Mass. Found at Tamworth, N. H., *Miss Hutchinson*; and at Jackson, N. H., *Davis* and *Fuller*. Mr. Davenport has specimens in his herbarium collected by him in a cedar swamp at Charlotte, Vt.

Though common, this plant is often overlooked because so small, and it has doubtless been referred when collected to either *B. simplex* or *B. matricariaefolium*. The differences between this and the former have been set forth in a paper presented at the meeting above referred to. It may be separated from the latter, briefly, by its small size, texture, vernation, once pinnate sterile, and undivided fertile divisions, and the large spores, which exceed those of *simplex* in size.

Seabrook, N. H.

ADAPTABILITY OF FERNS TO LIGHT.

A SERIES of experiments, carried on with reference to the amounts of sunlight needed by different ferns and their adaptability to varying amounts of sunlight, would be of much interest. Even closely related species differ markedly in this respect. *Dryopteris simulata* thrives only in very shady places, but its near relative, *D. Thelypteris*, requires much sunlight, and is at its best in an open swamp. *Woodwardia Virginica*, when growing in sunny places, has comparatively broad pinnae and pinnules which are set rather closely together. In shady places everything becomes narrower, and pinnae and

pinnules are farther apart. *Asplenium Bradleyi* thrives, and perhaps is at its best, when growing on a rocky wall exposed to the sun. Yet a plant in the moist air of a fernery where it received direct sunlight for only three or four hours, sent out new fronds and produced numerous sori. *Cystopteris fragilis* growing on a grassy bank is taller, coarser and yellower, than when growing in rich woods, besides being different in general appearance. And both of these forms are hardly to be compared with the one found on rocks in moist, shady ravines.—C. E. Waters, Johns Hopkins University, Baltimore, Md.

AN EXTENSION OF RANGE FOR WOODWARDIA RADICANS.

WOODWARDIA RADICANS was first discovered in this region in June, 1898. It was found growing in company with *Dryopteris munita*, *Adiantum pedatum*, var, *Polypodium falcatum*, etc. It was in fruit at the time of its discovery and was still in fruit on my last visit, Nov. 13. I should judge that it is an evergreen, for at the time of the latter visit, all the bracken had been killed by the frost, which had not changed this in the least. The fern grows from a very thick rootstock, which rises to the surface. From this ramify long, tenacious root-fibers, making it extremely hard to pull up. Nearly all the fronds were reclining gracefully, mingling with the fronds of the ferns above mentioned, making a very beautiful picture on the steep bluff forming the seashore. The full-grown plants are from five to six feet high and some of them measure seven feet from the caudex to the extreme end of the frond.

It seemed fairly abundant in this particular locality, but nowhere was it to be found back from the bluff forming the sea wall, not even where a deep gorge ran back, full of a variety of other ferns. In fact it never reached the top of the bluff, which was about fifty feet high, but seemed to be at home near the lower edge, where there was more moisture. It flourished best in a moist, sandy loam in the shade of spreading alders and other trees, both deciduous and evergreen. The whole region presents a semi-tropical aspect. I know of only one other locality where it is found. This is about fifteen miles from the region referred to above. Here also it is confined to the seashore. This would seem to indicate that it can only survive with us in the most

favorable places, and that Puget Sound is doubtless its northern limit. It seems strange that it should be so vigorous so far north. I am told that it has never been found before outside of California and Arizona. Its discovery here extends its range many hundreds of miles to the north where more depauperate forms might be expected.—*J. B. Flett, Tacoma, Washington.*

A FERN NEW TO THE UNITED STATES.

THIS is the species recently separated by Jenman from the familiar *A. aureum*. It is characterized, he states, by "its much larger size, numerous crowded fronds, the barren and fertile being uniformly separate—all the pinnæ of the one being barren and all of the other fertile—much more sessile leaflets (turned transversely with the rachis, the plane to the sky, like the blades of a step-ladder), intestiniform translucent pale-colored corpuscles covering the sporangia, which give a pale pruinose color to the soriferous under-surfaces." I might add that the meshes of venation are much finer, and point more directly toward the edge, and that the costal areoles, instead of lying lengthwise along the midrib, are generally longer the other way and point outward toward the edge. The venation is raised on the under surface and much more distinct than it is in *A. aureum*, looking honeycombish, as if it were made of whitish-yellow wax, while in *A. aureum* it is of the same color as the rest of the frond or darker. Jenman gives Bermuda as one of the habitats of this species. The Devonshire marsh, where it grows, lies in the central valley of the large center island which is known as "the Mainland," and is out of the reach of tide-water. The plants strike every one who sees them as being magnificent in size, reaching far above the head of any man, sometimes to the height of eight or nine feet. Mr. Jenman says "this is the plant figured in Eaton, Ferns N. Am., for *A. aureum*, though true aureum is also found in Florida. It ranges from Florida and the Bahamas down through the West Indies and Guianas to the Brazils." This therefore adds another species to the ferns of our own country. Eaton figures only the fertile frond, but shows a small section of it with the sporangia removed, thus disclosing the venation. This is represented as running rather more oblique to the rachis than it does in *A. lomarioides*, but in other respects the figure is fairly good. It is taken from an Indian River specimen, where, he tells

us, the fronds grow very tall and have all the pinnæ of the fertile frond fertile and close appressed to the rachis; which is a correct condensed description of *A. lomarioides*. The specimens are very stiff and difficult to press on account of the peculiar position of the pinnæ mentioned by Jenman, which makes it necessary to twist them around in order to make them lie in a plane with the rachis.—*From Revision of the Bermuda Ferns, by B. D. Gilbert, in Bulletin of Torrey Botanical Club for December.*

THE TURKEY-FOOT FERN.

A PROMINENT student of ferns sends us the following query: "Can any of your readers tell what species is meant by Dr. S. Weir Mitchell, in his charming novel, 'Hugh Wynne' (p. 43, vol. 1), when he speaks of 'Turkey-foot ferns' as growing plentifully, 125 years ago, in the neighborhood of Philadelphia? I have looked in Pursh, Eaton, Bigelow, Torrey and all the modern botanies, but can find no such designation. Perhaps it was a local name not known in New York or New England. I do not recall whether the fern grew in woods or in the open, but know that it did not grow on rocks. So it would seem as if the name was more appropriate for some species of *Phegopteris*, or possibly *Onoclea*, than for any of the larger and longer ferns. If the species can be traced, it will add another interesting idiomatic name to the list already known."

In the hope of getting some light on the subject, a note was addressed to Dr. Mitchell, who replied as follows:

"DEAR SIR—No botanist can help us. I believe that the fern was what used to be called the Imperial fern—probably 'Turkey-foot' was local. It was in common use when I was a boy. The common name has obvious meaning, and should be preserved.

Yours truly, WEIR MITCHELL."

Can any of our readers add further information? Until there is more definite knowledge upon the subject, we can only guess at the species meant. That the fern grew abundantly might indicate *Onoclea*, but scarcely *Phegopteris*, the latter being too retiring to attract special notice from any save botanists. Dr. Mitchell's allusion to the "Imperial fern" suggests that Turkey-foot is another name for *Osmunda regalis*. If the plant was named from its resemblance to a turkey's foot, the bracken may have been meant. However, there is often no accounting for the origin of common names, and a solution of this problem will be gladly received.

TUBERS OF NEPHROLEPIS.

WHEN changing to a larger pot, the tropical sword fern (*Nephrolepis exaltata*), a number of corm-like growths were found attached to the roots, and not to underground stems. These growths were of all sizes up to three-fourths of an inch in diameter and irregularly rounded. No indications of buds were discovered. Some of the largest corms were planted, but did not grow. Le Maout and Decaisne mention a *Nephrodium esculentum* of Nepal, that furnishes edible tubers, used by the natives.

It would hardly seem that the economy of this sworn fern requires a third means of reproduction, since it sends out numerous runners and also produces spores freely.—Mrs. J. M. Miligan, Jacksonville, Ill.

[In Jenman's synoptical list of the ferns of Jamaica, published in the Bulletin of the Botanical Department of Jamaica, the writer notes that this tuber-bearing habit is characteristic of several species of *Nephrolepis*. Among the points which distinguish *N. pectinata* from the others, the absence of tubers is mentioned, while in another species these are so common that Hooker named it *N. tuberosa*. The tubers are considered as a third means of propagation, the other two being spores and stolons. As our correspondent notes, the common sword fern (*N. exaltata*), has all three. In Jamaica, this species often ascends the trunks of palms to a considerable height by means of its stolons, from which it is commonly called the walking-fern in Jamaica. Can our readers furnish us with other instances of ferns bearing tubers?—ED.]

FERN VARIATION.

IN reference to the incised varieties of *Dryopteris acrostichoides* and *Asplenium Trichomanes*, Mr. Raynal Dodge explains the peculiarity as resulting from the removal of the forest trees in whose shade the plants grew. If these peculiar forms are entitled to be termed varieties, why may not the same peculiarity in *Osmunda cinnamomea* be entitled to the same dignity. I have found a large quantity of fronds of the last named fern very beautifully incised, as much so as any fern I ever saw. I think they may properly be labeled *O. cinnamomea incisa*.

I hardly agree with Mr. Dodge's theory as to the cause producing *O. cinnamomea frondosa*. I have found the variety abundantly on land which I know has not been burned over for fifty years or more. I believe the same cause that produces the variety *incisa* will also produce variety *frondosa*, and is also liable to change the form of *Pteris aquilina* and possibly of some others. I have *frondosa* with fertile pinnæ below and others with fertile pinnæ above the sterile, and some with spore cases adhering to the under side of sterile divisions, very much like ferns not dimorphous.—*J. Warren Huntington, Amesbury, Mass.*

Dryopteris acrostichoides incisa is found wherever the type grows, and Eaton says Prof. Harvey reported it as the common form in Arkansas. Of this I am certain, that it seldom grows in the shade to perfection. If, however, the woods be cut off, they immediately revert to the form, densely fruiting and deeply incised. I collected about three hundred fronds in one small locality last year, in an open on the north side of a hill where hemlock woods had been cut two years ago. All around was the type in the greatest abundance I ever saw. On one side were large hemlocks, and the edge of the woods marked the limit of the *incisa*. On another side was a growth of saplings, where the woods must have been cut fifteen years ago. Here I found not one *incisa*, though the type was everywhere.

This holds good in every instance where I have found good *incisa*. It seems to be owing to extreme luxuriance that this form is taken on, for I have found it growing late in the season from roots that did not show it on other fronds, but for some reason were so vigorous they had to use some of their extra energy in a second growth. In these cases there was but little fruit, though my finest fronds are of it. I find that it fruits densest the second year after the wood is cut. I have several fronds of which the lowest pair of pinnæ are more than half covered, and the fourth pair completely so.—*Alvah A. Eaton, Seabrook, N. H.*

SENSITIVENESS OF FERNS TO ENVIRONMENT.

FERN collectors often speak of clearing away rubbish from some rare species in order to give the remaining specimens a better chance. Obviously the collector and the culturist are two distinct institutions. Nothing will further the

work of extermination more rapidly than the removal of old fronds and decaying vegetable matter. Nature may not be an orderly dame, but she understands her business and utilizes all her waste for protection and fertilization. "Through death comes life," and no where is it better exemplified than in the fern world. Furthermore, who can tell where microscopic wind-blown spores are lodged? The superficial observer never dreams that the green filmy suggestion on the decaying leaves which he ruthlessly brushes away is the prothallia of the very fern he is seeking to preserve.

Fern photography requires a deal of clearing around the subject to be taken, otherwise confusion of "sticks and straws and dead men's bones" spoil the detail of the picture. I have cleared a goodly number of choice places for the camera, and in every instance where I have re-visited the field the following year, I have observed a marked deterioration of the ferns. I have in mind a splendid specimen of *Dryopteris marginalis*—a perfect crown of nine large fronds spread over a carpet of pine-needles. I removed all of the old fronds and cleared old fallen leaves away. The next season I counted but seven fronds, all smaller than those photographed. The second summer but five more or less imperfect fronds unrolled. Even a moss-covered rock with an embroidered front of Walking-leaf resented my interference. Nature is a sensitive house-keeper and prefers to do her own picking up for the preservation of some of her rare gifts. We had best let her luxuriate in seeming disorder.—G. A. Woolson, Pittsford, Vt.

ADIANTUM CAPILLUS-VENERIS IN DAKOTA.

SPECIMENS of *Adiantum capillus-veneris*, said to have grown wild at Cascade in the Black Hills of South Dakota, were sent to me by Mrs. Alice M. Crary a couple of months ago. Yesterday, in company of Dr. Frederic E. Clements, I visited the locality and found the ferns growing in great abundance along the banks of a stream of warm water which issues from several large springs. The banks of this stream for nearly a mile are lined with the fern in all sizes and ages, from those just issuing from the gametophyte (which were abundant), to fruiting specimens 40 to 50cm high. A thorough examination convinced us that it is indigenous along this warm stream, and that it has not been introduced by human agency.—Charles E. Bessey in *Botanical Gazette* for October, 1898.

OUR MISCELLANY.

I observe from a note by C. F. Saunders, that among others he has not found *Botrychium ternatum* in New Jersey. I have found it frequently in this neighborhood, though not so plentifully during the past two years. The variety *incisum* has seemed more common in localities where I have found it than the ordinary forms, but both are found.—*Elwyn Waller.*

To a great many fern students it would be very satisfactory to know just why Linnæus gave the specific name *sensibilis* to our common *Onoclea*. More than one suggestion has been offered for the derivation of the name, but none seems to have noticed the one by the early botanist, Eaton. In the fourth edition of his botany, published in 1824, he says of it: "The leaflets slowly approach each other on squeezing the stem in the hand." Has anyone a more plausible theory to account for the derivation of the name?

Your correspondent was quite right in his inference that *Osmunda Claytoniana* might do well in cultivation. Here it is found under the varied conditions noted, a favorite rendezvous being old pasture fields which have been for years denuded of trees but never put into cultivation. I have transplanted it with success to my wild flower bed during the fruiting stage. *O. cinnamomea* is also desirable for cultivation. I have never found *O. regalis* save in the large swamps. A specimen transplanted some years ago is barely living, but has never produced fertile pinnæ. Though watered frequently during dry weather, it evidently pines for its swampy home.—*Bessie L. Putnam, Harmonsburg, Pa.*

In reference to *Dryopteris acrostichoides*, it may be of interest to note the origin of the best known common name. The name christmas fern appears to have been thus applied for a comparatively short time. In the *Bulletin of the Torrey Botanical Club* for 1873, Prof. D. C. Eaton, writing of Mr. John Robinson's recent fern list, remarks; "Our well-known *Aspidium acrostichoides*, so available for winter decorations, is happily christened christmas fern—a name which I certainly hope will be adopted." The name has since come into common use, and for its suggestiveness alone is much to be preferred to "Wood-fern," by which the plant is also known in parts of New England.—*W. R. Maxon, New York.*

EDITORIAL,

It is now nearly six years since the first number **PAST, PRESENT AND FUTURE** of this journal was issued. Short as this period has been, it has sufficed for the development of an interest of ferns that is most remarkable.

When the first tiny LINNEÆAN FERN BULLETIN made its appearance, the number of persons generally known to be interested in American ferns was less than a score; to increase this number was the task set for the journal. In thus making a circle of readers for itself the difficulties were found to be fewer than were at first anticipated, for it was not necessary to interest people in ferns—scarcely a lover of outdoors that did not wish to know more about them—but rather to convince them that these most beautiful of plants are as easy to study as are any that bear flowers. The success that has attended these efforts have been made apparent in succeeding issues of the FERN BULLETIN. Six times the journal has been enlarged, twice by an increase in the size of the page, and four times by additional pages. Our support now warrants us in making a further increase of four pages an issue and the current volume will consist of one hundred and twelve pages. The pages recently added were devoted to the mosses; these we now add will be devoted to ferns. No increase in the subscription price is made, but the editor requests that in return for the extra pages, readers will show the magazine to their friends and endeavor to have them subscribe. It is our intention to enlarge the journal as often as circumstances warrant and the subscriber who secures for us a single subscription as surely benefits himself as he does his friend and us. If the support of fern lovers increases in the future as it has in the past, the day is not far distant when the journal will be again increased in size.

* *
*

OUR NEW ADDRESS With the removal of the New York Botanical Garden office to Bronx Park, the New York office of the FERN BULLETIN also goes farther up town. As before, all subscriptions and general business should be mailed to Binghamton, but correspondence intended for the editor should now be addressed to Willard N. Clute, New York Botanical Garden, Bronx Park, New York City.

ANOTHER FERN MEETING Preparations are already being made for a meeting of fern students in New York, the last week in March, 1899. A lecture by Mrs E. G. Britton on "Ferns and Their Haunts," will be one of the principal features of the meeting, and several other well known fern students will speak. Mrs. Britton's lecture will be illustrated by colored lantern slides, made from photographs by the well known artist, Mr. Cornelius VanBrunt. Good photographs of our native ferns are desired for this purpose, and correspondence upon this subject may be addressed to Mrs. Britton, in care of this journal. All who are interested in ferns are invited to be present. A copy of the program, when completed, will be sent to those who apply for it.

NOTES.

—In the October FERN BULLETIN, the proof-reader made us refer to *Camptosorus Sibiricus* as like *C. rhizophyllus* in *fruiting* at the apex of the fronds; the word should, of course, be *rooting*

—We announce with deep regret the death of Mr. G. H. Hicks, First Assistant Botanist of the U. S. Department of Agriculture, and editor of the *Asa Gray Bulletin*. Mr. Hicks died very suddenly at his home in Washington, D. C., Dec. 7, 1898.

—A much needed revision of the ternate species of *Botrychium* by Dr. L. M. Underwood, appears in the October *Bulletin of the Torrey Botanical Club*. The author has had access to the material in all the principal herbaria, and these studies have resulted in some very interesting conclusions. Of the fifteen species of the "*B. ternata*" group, which are recognized, seven do not occur in North America, and among these is the true *B. ternatum*, whose habitat is given as Japan, China and India. Our American species comprise the recently described *B. biternatum* of the Southern States; *B. dissectum*, a common fern of the Atlantic seaboard, hitherto called a variety of *B. ternatum*, but not to be confused with the same so-called variety farther inland; *B. obliquum*, the common form of Eastern America, and its variety *intermedium*; *B. Silaifolium*, from the Pacific coast; *B. Coutleri*, from the region of the Yellowstone National Park; *B. occidentale*, from Washington and British Columbia; *B. matricariæ*, from New York, New England and Canada, and *B. decompositum*, from Mexico.

BOOK NEWS.

It is to be doubted whether the "newer botany" could have a better interpreter than Prof. Geo. F. Atkinson, whose book on "Elementary Botany"* has just appeared. A place is claimed for the work as a manual for beginners, but it is much more. Every page bristles with facts which it will profit all botanists to know, told in concise and attractive language very different from that of the ordinary text-book. The chief merit of the work, however, is in the arrangement of the matter in such a way that a survey of the whole sphere of plant life is obtained and the relationships of the higher and lower orders distinguished. The first hundred pages deal with plant Physiology, the chapters treating of such topics as irritability, transpiration, respiration, root pressure, nutrition, etc. Then follows Part II, devoted to Morphology, beginning with the lowest forms and proceeding upward through the Algæ, fungi, liverworts, mosses and ferns to the higher forms of plants. Part III. is devoted to Ecology. This part will doubtless be of the most interest to the general botanist. In this are treated at length such subjects as winter buds, leaf arrangement, dimorphism of ferns, formation of early spring flowers, soil formation, plant communities, etc. There are 509 illustrations in the book, most of which were made especially for it. The book is worthy of a place in the library of every botanist.

Under the title of "Symbolæ Antillanæ,"† Borntæger Brothers have brought out the first part of a comprehensive work on the flora of the West Indies, edited by Ignatius Urban. This work will be issued in parts at indefinite intervals—each part composed of from one hundred to two hundred pages. The first fascicle is devoted to the botanical bibliography of the West Indies, the titles of books and articles being given in the language in which they were originally published, followed by observations of their contents in German. This initial part seems very complete. If subsequent parts are up to this standard, the work when completed, will be invaluable to all students of the West Indian Flora.

*"Elementary Botany," by George Francis Atkinson, Ph. B. New York; Henry Holt & Co., 1898. 12-mo., 444 pp., price \$1.25.

†"Symbolæ Antillanæ sen Fundamenta Floræ Indiæ Occidentalis," by Ignatius Urban. Vol. I. fascicle I. Berlin; Gebrüder Borntræger, 1898. 8-vo, 192 pp., price 10 marks.

THE LINNAEAN FERN CHAPTER. OF THE AGASSIZ ASSOCIATION.

—The election in October resulted in the following officers for 1899: President, Alvah A. Eaton; Vice-President, W. A. Murrill; Secretary, Will R. Maxon; Treasurer, James A. Graves. The full report of the Judge of Elections will appear in the annual report.

—The annual report, which will be ready in January, will contain in addition to the reports of officers, a list of all members. Any changes of address, etc., should be reported to either the secretary or treasurer at once.

—It has been thought best for the Chapter to publish the papers read at the Boston meeting and they will be issued in neat booklet form early in the year. If there are any who have not yet ordered a copy, they should do so at once if they wish to secure one.—C.

—New members have been admitted to the Chapter since the last notice, as follows: Active—Mrs Joseph Mann, 583 Carroll street, St. Paul, Minn. Associate—Rev. W. L. Chaffin, North Easton, Mass.; Miss Alice E. Dacy, 28 Ward street, South Boston, Mass.; Miss Mary E. Hart, Western College, Oxford, Ohio.

—Specimens of *Pellaea atropurpurea* are offered to members of the Chapter by Mr. C. F. Saunders, 307 Walnut street, Philadelphia, Pa. Five cents for postage should be enclosed with requests for specimens. Mr. Alvah A. Eaton, Seabrook, N. H., offers germinating bulblets of *Lycopodium lucidulum*, to any member sending him a stamped and self-addressed envelope.—C

IMPORTANT NOTICE.

The proposition to amend the Constitution, by making dues of active and associate members the same, and at the same time limiting the number of active members to one hundred, has been very carefully considered and it is believed will meet with the approval of the Chapter. For some time the cost of the various publications sent to associate members has exceeded the revenue from their dues, and as a still greater number of such publications will be issued in the future, this increase in dues seems only just.

Should this proposed amendment be carried, associates who have paid dues at the old rate for 1899, will not be required to pay any more for this year. Associates paying after the receipt of this notice will be required to pay \$1.00. At present there are more than one hundred active members on our list. None of these will be dropped from the active list and no more will be added until the number falls below one hundred. When this occurs, active members will be elected from the associate list in the order in which they were admitted to the Chapter.

Amendments to the Constitution of the Linnaean Fern Chapter.

The number of the BULLETIN containing the Constitution has become so rare that some of our readers have never seen it. It has therefore been decided to reprint the Constitution in the forthcoming Annual Report. Before this can be done it seems necessary to make a few changes in it to bring it up to date, and these are embodied in the following amendments, which members will vote upon at once.

Art. III.—Strike out Sections 2, 3 and 4, and insert as follows:

“Sec 2. Membership shall consist of Active and Associate members.

“Sec. 3. Active membership shall consist of not more than one hundred members. Vacancies in the Active membership shall be filled by the Executive Council, who shall elect such members from those in the Associate class in the order of their admission to the Chapter.

“Sec 4 Applications for Associate membership shall be made to the Secretary, who shall report such applications to the Executive Council. The Executive Council shall have full power to elect, and one adverse ballot shall exclude.

“Sec. 5. Regular dues shall be one dollar annually, payable in January of each year.”

In Sec. 5, strike out “5” and insert “6.” Also strike out the word “six” in the first line and insert “two.”

Art. IV.—Strike out the first three lines and insert, “members are expected to report quarterly to the President the results of their studies. He shall.”

Art. VIII.—Sec. 2. Strike out the words, “In good standing.”

Every Active member may vote upon these amendments. Those not voting will be counted in the affirmative. Voting ends Feb. 1, 1899. All votes should be addressed to the new Secretary, Will R. Maxon, New York Botanical Garden, Bronx Park, New York City.

THE BRYOLOGIST,

A DEPARTMENT OF THE FERN BULLETIN,
DEVOTED TO THE STUDY OF NORTH AMERICAN MOSSES.
ISSUED QUARTERLY.

EDITED BY DR. A. J. GROUT, PLYMOUTH, N. H.,
To whom all correspondence regarding the mosses should be addressed.

This department is issued separately at twenty-five cents a year. Subscriptions should be addressed to the Fern Bulletin, Binghamton, N. Y.

VOL. II.

JANUARY, 1899.

NO. I.

HEATER FOR GLYCERINE JELLY SLIDES.

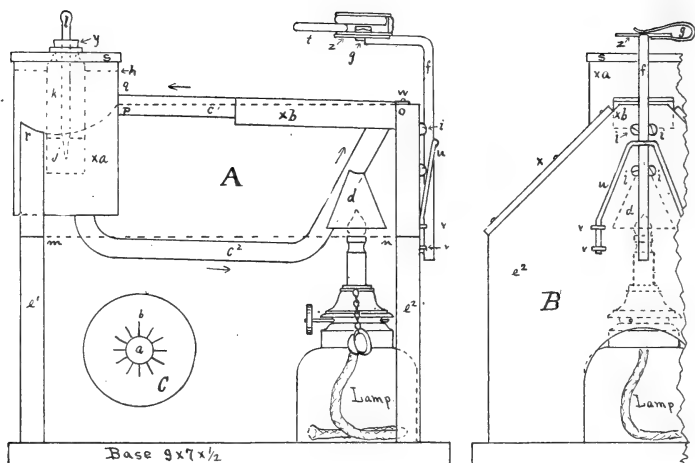
BY J. FRANKLIN COLLINS.

A FEW years ago while making glycerine jelly mounts by one of the old, laborious methods (one which is still in use), it occurred to me that there ought to be some more convenient method devised. After some experimenting, an apparatus was constructed which seemed to answer the requirements of economy and convenience. I have now been using it about three years and find it a great improvement over the old method. Recently Dr. G. G. Kennedy had one constructed with some slight modifications. After it was completed I used it several times and found it did the work as well, in every respect, as mine, and had the advantage of being simpler in construction.

The accompanying illustration and description embody the better features of both heaters, though following the lines of Dr. Kennedy's more closely than of mine. The figures are one-fourth natural size, so that any dimensions not specially stated can be ascertained by measuring the drawing and multiplying by 4.

A is a side view with the hand-rests removed; *B* shows a portion of one end (the lamp end), with hand-rest (*x*) in place and hand lens (*l*) removed, *C* (inserted within the contour of *A* in order to economize space) is a plan of the cover *s* shown in *A* and *B*. The base and supports (*e*,¹ *e*²), as well as the hand-rests (*x*), are of white-wood; all other parts are of brass or copper, except *f*.

The circular tank *xa* is connected with *xb* by the two $\frac{3}{8}$ inch pipes *c*¹ and *c*². *xb* is a rectangular box about $3\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{2}$, on the flat top of which the blank slide is placed to heat. This flat



top extends back a short distance so as to allow a small tack (w) to fasten it to e^2 at o . The top of the other support (e^1) is cut to fit closely about the tank. The broken lines $m-n$ and $r-p-w$ indicate the position of hand-rests (x), which are tacked to the oblique portions of the supports, and cut to fit about tank. The line $w-q$ is slightly slanted to facilitate the escape of any bubbles generated in xb . On c^2 a flame shield (d), with a small vent at top, is fastened. The supports (e) can be lengthened or shortened at bottom if the flame does not occupy about the relative position indicated in fig. *A*. The lamp should be (preferably) one with a rack adjustment for wick, and the wick about $\frac{3}{16}$ of an inch in diameter.

A $\frac{3}{16}$ steel rod (f) is bent near top and a flat place filed at end and a small circular plate (z) soldered thereto. To the under right hand side of this a thin, flat brass spring (g) is riveted or soldered. By this arrangement any hand lens can be held in position for examination of sections on slide beneath it, as shown in fig. *A* (t). A thin white paper under the slide will help to better distinguish objects. The focus of lens is adjusted by sliding the rod f between the four round-headed screws (z) which guide it, and the brass wire spring (u) which holds it firmly in place. The spring u should be less than twice the thickness figured, and firmly fastened with four staples (v).

In fig. *C* the circle *a* is cut out to fit closely about the narrowest part of the neck of the homeopathic vial (*k*) containing the glycerine jelly (*j*). The radiating lines *a-b*, etc., are cut with a fret saw and the metal portions between them bent out (one at a time) until *a* is large enough to allow the top of the vial to be thrust through.

The metal is then bent back and the bottle is held as shown in fig. *A*.

To place jelly on slide, remove the glass rod (*l*) and cork (*y*) together, and touch end of rod to the warm slide on *xb*. If more jelly is required, repeat.

To prepare for use, pour into *xa* sufficient hot water to raise the level to *h*, when vial *k* is in position, and place lamp with *small flame* in position. As soon as jelly is fluid it is ready for use and will remain so as long as the water level is kept above the tube *c*¹, and the lamp is kept burning. The circulation of water, which should never *boil*, is indicated by the arrows.

THE DICRANUMS.—II.

It is hoped that the following purely artificial key may prove of value to beginners:

- | | | |
|--|----|--------------------|
| 1—Capsule cernuous, more or less arcuate. | 2 | |
| Capsule erect, symmetric. | 14 | |
| 2—Upper leaf cells longer than broad, porose. | 3 | |
| " " " not porose, nearly as broad as long. | 5. | |
| 3—Capsules clustered, leaves strongly transversely undulate, silky. | | <i>undulatum.</i> |
| Capsules solitary. | 4. | |
| 4—Leaves transversely undulate when moist, slightly or not at all secund; costa without lamellæ at back. | | <i>Bonjeani.</i> |
| Leaves not at all undulate, secund, with strongly serrate lamellæ at back. | | <i>scoparium.</i> |
| 5—Leaves strongly papillose at back, little or not at all secund. | | <i>spurium.</i> |
| Leaves not noticeably papillose. | 6. | |
| 6—Capsules clustered. | | <i>Drummondii.</i> |
| Capsules solitary (rarely two together in <i>Mühl-</i>
<i>enbeckii</i>). | 7 | |
| 7—Costa not reaching apex. | | <i>Bergeri.</i> |
| Costa percurrent or excurrent. | 8 | |

- 8—Lower leaf cells more or less porose; capsules not strumose (except slightly so in *D. pallidum*). 9
 Leaf cells not at all porose; capsules strumose. 12
- 9—Leaves entire or very faintly denticulate. *elongatum*.
 Leaves serrulate. 10
- 10—Leaves strongly falcate-secund; upper leaf cells regular. *fuscescens*.
 Leaves little or not at all secund; upper leaf cells very irregular. 11
- 11—Costa at least $\frac{1}{6}$ width of leaf at the broadest point of the leaf. Plants 3–6 cm. high. *Mühlenbeckii*.
 Costa $\frac{1}{10}$ width of leaf; plants 2–3 cm. high. *pallidum*.
- 12—Leaves falcate-secund. 13
 Leaves spreading. *schisti*.
- 13—Leaves with distinct angular cells; capsule oblong-cylindric. *Starkei*.
 Leaves with few angular cells; capsule short, obovate. *falcatum*.
- 14—Costa ending in the serrulate apex; leaves curled when dry. 15
 Costa excurrent; leaves scarcely altered by drying (except *D. fulvellum* and *D. fulvum*) 16
- 15—Apex of leaf papillose at back; upper leaf cells rectangular. *montanum*.
 Apex of leaf not papillose; upper leaf cells less regular; plants commonly giving off numerous axillary erect flagellæ bearing minute ecostate leaves. *flagellare*.
- 16—Costa narrow, $\frac{1}{5}$ to $\frac{1}{4}$ width of leaf at base. 17
 Costa broader, $\frac{1}{3}$ to $\frac{1}{2}$ width of leaf. 18
- 17—Dioicous; 3–4 cm. or more high. *Sauteri*.
 Autoicous; 0.5–2 cm. high. *fulvellum*.
- 18—Margin and costa of leaves entire; apex usually broken. *viride*.
 Margin and costa of leaves serrulate. 19
- 19—Costa equalling $\frac{1}{3}$ width of leaf at the base, or less; leaves gradually narrowed to apex; all upper surface leaf cells rectangular. *fulvum*.
 Costa $\frac{1}{3}$ width of base of leaf, or more; leaves abruptly narrowed to a long slender point; all upper leaf cells greatly elongated-linear. *longifolium*.

Look on the summit of your highest accessible hill or mountain for the long-leaved Dicranum (*D. longifolium*). It grows on stone walls and exposed rocks. It is usually sterile, but is easily recognized and distinguished from the fulvous Dicranum

by the characters given in the key. *D. Drummondii* grows in much the same situations as the wavy *Dicranum*, and is frequently mingled with it. Its capsules are also clustered and the leaves slightly wavy. The waviness of the leaves is much less marked and the plants have not the same silky sheen. The upper leaf cells are much shorter, nearly as broad as long and afford a sure ground for distinction. *D. viride* is probably not very rare, but is almost always sterile. It can be distinguished by the broken-leaf apices and the other characters given in the key. *D. spurium* does not look like a *Dicranum* because of the equally spreading soft crisped-incurved leaves. Under the microscope its leaves are readily distinguished from those of any other species by the large and conspicuous papillæ which cover the upper part of the back of the leaf and are easily seen because the margins are incurved in this region. *Dicranella heteromalla* has the same general appearance as the *Dicranums*, and is very common. It is smaller than most of the *Dicranums*, and its leaves lack the inflated angular cells so characteristic of *Dicranum*. Other species of this and allied genera may be met with, but they can readily be distinguished from *Dicranum* by the characters mentioned in the last article.

GEOGRAPHICAL DISTRIBUTION OF DICRANA.

By RODNEY H. TRUE.

AT the suggestion of Dr. Grout, I have prepared the following brief statement of the distribution of twenty species of the genus *Dicranum* selected by him. I have used such local lists and similar helps as were at my disposal and wish it borne in mind that I am not able to warrant the accuracy of the determinations on which they were founded. I hope, however, that, by reference to a large body of authentic herbarium material, I have been able to give a substantially correct idea of the distribution of these mosses. I should be willing, as far as my time permits, to determine doubtful forms for any who care to send specimens and letter postage for reply.

Dicranum Bergeri Bland. A moss characteristically found in marshy places, most frequently in sphagnum bogs; widely distributed.—N. J., New Eng., Can., Greenland, Wis., Minn., Rocky Mts., Alaska.

Dicranum Blytii Schimp. (*D. schisti*). A rare Arctic species.—White Mts., Labrador, Greenland, Selkirk Mts., Vancouver Id., Brit. Col.

Dicranum Bonjeani de Not. The species or its varieties found in both lowlands and in subalpine regions. The species in its typical form is most frequent in moist locations; widely distributed.—N. C., Penn., New Eng., Ontario, Greenland, O., Ill., Wis., Mont., Wash., Brit. Col., Alaska.

Dicranum Drummondii Muell. A moss of the woods; probably does not occur as far west as Rocky Mts.—N. Y., New Eng., Ontario, Minn.

Dicranum elongatum Schwaegr. A moss of alpine and subalpine range; rather rare.—White Mts., Me. (Mt. Katahdin), Newfoundland, Greenland, N. shores L. Superior, Alaska.

Dicranum falcatum Hedw. A rare alpine moss found in White Mts., Oreg. (Mt. Hood), and Wash. (Röell).

Dicranum flagellare Hedw. A very common species in woods; one of the most widely distributed species.—Va., N. J., Mass., New Brunswick, Ontario, O., Mich., Minn., S. D., Manitoba, N. W. Terr.

Dicranum fulvellum (Dicks.) Smith. A rare alpine species.—White Mts., Adirondacks (?), Oreg. (Mt. Hood), Greenland.

Dicranum fulvum Hook. A less widely distributed species characteristic in regions marked by outcrops of silicious rocks.—N. C., Va., Penn., N. Eng., New Brunswick, Ontario, Wis.

Dicranum fuscescens Turn. Widely distributed in mountainous or high, hilly country, in woods.—Va., N. Y., N. Eng., New Brunswick, Newfoundland, Greenland, Ontario, L. Superior, Minn., Col., Wash., N. W. Terr., Alaska.

Dicranum longifolium Hedw. Characteristic of rocky, elevated regions.—Va., N. Y., N. Eng., Miquelon Id., Greenland, Mich., Minn., Mont., Col., Selkirk Mts., Rocky Mts., Brit. Col.

Dicranum montanum Hedw. On decaying wood in forests, less frequent in southern range of genus.—N. Y., N. Eng., New Brunswick, Quebec, Niagara Falls, Wis., Minn., Mont., Manitoba.

Dicranum Mühlenbeckii Bry. Eur. Usually in rocky, elevated regions; also in subalpine localities; more frequent westward.—Penn., Vt., Ontario, Hudson's Bay, Wis., Mont., Col., N. M., Wy., Wash., Brit. Col., Alaska.

Dicranum pallidum Bry. Eur. Characteristic in southern part of the range of genus, in low, sandy regions.—Fla., Ga., N. C., N. J., Wis.

Dicranum Sauteri Schimp. A subalpine species rare to America.—Adirondacks (Mrs. E. G. Britton).

Dicranum scoparium Hedw. One of the most widely distributed species.—N. C., Va., Md., Penn., N. Eng., New Brunswick, Newfoundland, Greenland, Ontario, Mich., Ind., Ill., Minn., Mont., Wy., Col., Cal., Wash., Alaska.

Dicranum spurium Hedw. Characteristic in barren localities eastward. A rather rare species.—Va., N. J., Vt., Nova Scotia, Quebec, Ontario.

Dicranum Starkei W. & M. A rare alpine moss.—White Mts., Idaho, Wash., Vancouver Id., Rocky Mts., Selkirk Mts., Smith's Sound.

Dicranum undulatum Ehrh. A moss of lowlands, widely distributed.—N. J., N. Eng., New Brunswick, Newfoundland, Labrador, Ontario, Mich., Ill., Minn., Vancouver Id., Brit. Col.

Dicranum viride (S. & L.) Lindb. Characteristic of forests and shady places; widely scattered east of eastern slope of Rocky Mts. Seems to be replaced by *D. strictum* (Schleich), in the West.—Va., N. Y., Vt., New Brunswick, Ontario, Newfoundland, O., Wis., Minn. Reported at Morley, in Rocky Mts., by J. Macoun.

Grimmia mollis B. & S. in the United States.

Last summer, while on a vacation outing in northwestern Montana, I collected some mosses around Lake McDonald, Flat-head county. Sperry Glacier, about ten miles east of the north end of that lake, was one of the objective points of our collecting trips. It was at the foot of this glacier that I found a curious soft *Grimmia*, which on investigation after my return home, proved to be *Grimmia mollis* B. & S. This is the first discovery of this truly glacial moss on the North American continent. In Europe it occurs, usually above 6,000 feet altitude, in the Pyrenees, the Alps, the mountains of Bohemia, and of the Scandinavian Peninsular, always near glaciers, or streams fed by glaciers or snow-fields. It has also been found in Greenland. This distribution makes its almost certain that *Grimmia mollis* also occurs in the Canadian Rockies. But whether it has come to our regions by way of Greenland around the north, or south of Hudson's Bay, or by way of the Alaskan mountains, across Behring's Strait, from the direction of Siberia, needs to be determined by finding intermediate stations.—*John M. Holzinger.*

Mosses For Distribution.

Mosses offered the Chapter are: By Mrs. E. G. Britton, 103d St. and Amsterdam Ave., New York City, *Dicranum viride* for a self-addressed stamped envelope; by A. J. Grout, *D. Drummondii*, *D. spurium*, *D. longifolium* and *Dicranella heteromalla*, for ten cents to members.

A Correction.

In the second line of the second paragraph on page 41 of the 1898 FERN BULLETIN, for "asexual" read "sexual." We hereby acknowledge our obligation to the subscriber who called our attention to this slip of the types.

THE SULLIVANT MOSS CHAPTER OF THE AGASSIZ ASSOCIATION.

—The Sullivant Moss Chapter starts out with a charter membership of over thirty, a very promising beginning indeed.

—A list of members and a draft of the constitution will have reached each member before this issue of the BRYOLOGIST.

—The committee announced in our last issue have appointed the following officers for 1899: President, A. J. Grout; vice-president, J. Franklin Collins, of Providence, R. I.; secretary and treasurer, Mrs. Annie Morrill Smith, 78 Orange St., Brooklyn, N. Y. It was deemed best to appoint officers for the first year until a constitution should be adopted and the organization perfected. All communications with reference to membership, dues, etc., should be addressed to Mrs. Smith.

—The president proposes that for their Chapter work the members try to obtain new facts concerning the distribution of the Dicranums by collecting and studying all the species to be found in their localities. To assist in this we publish an entirely new key, and Dr. True has very kindly given us the known ranges. The extension of the known range of any species should be noted and note and specimen forwarded to the secretary. In case any of the species Dr. True has noted as rare should be collected, it should also be forwarded with full notes.

—On account of the snow we may not be able to accomplish much except to become familiar with our specimens already collected. It is hoped that enough notes may be received by the first of March to enable the secretary to give a very creditable account of work accomplished, and that before the year is over we may make a valuable addition to the knowledge of the distribution of this and other genera.

—The president is strongly of the opinion that the concentrated study of a single genus is much the best way, for the beginner at least, to study the mosses. One learns to recognize species and to distinguish closely related species to a degree that is otherwise impossible. The president himself while studying Dicranums for the BRYOLOGIST found right at home three species that he had never collected before.

30 cts. per Year.
15 cts. per Copy.

Vol. VII.

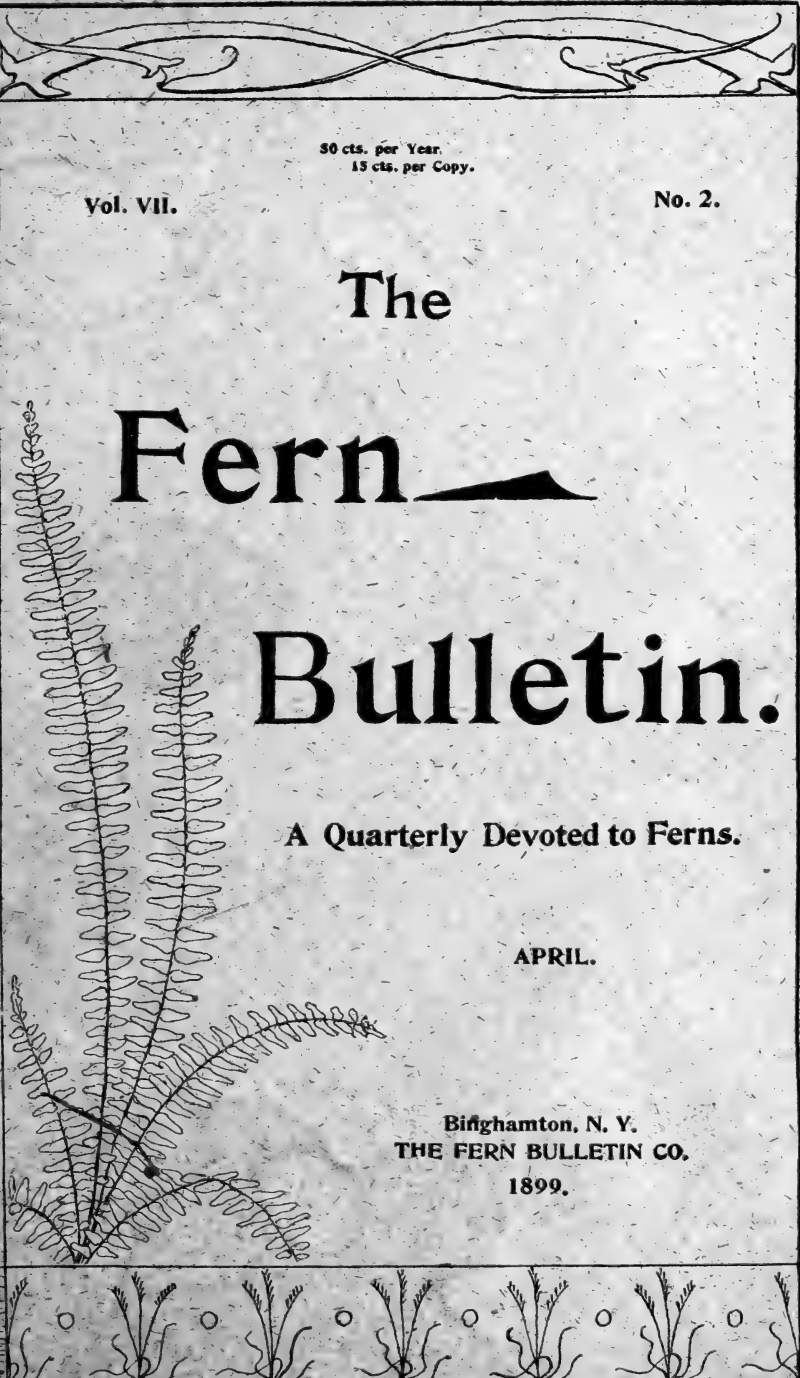
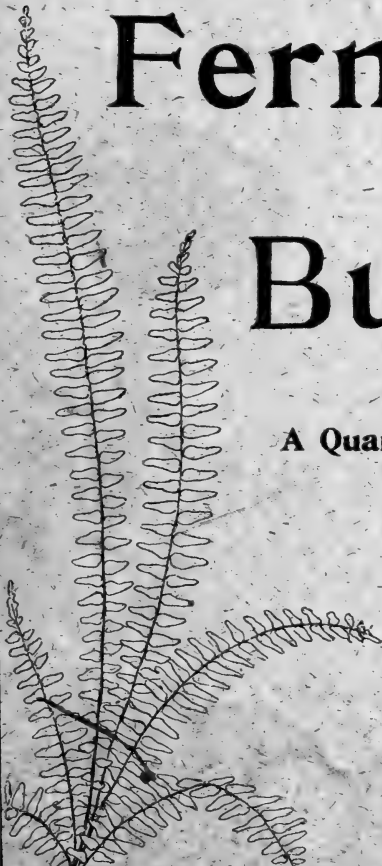
No. 2.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

APRIL.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1899.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

With the *Asa Gray Bulletin*, to new subscribers of both journals, 80c.

Articles pertaining to any phase of Fern life solicited.

Communications intended for the editor should be addressed to Willard N. Clute, New York Botanical Garden, Bronx Park, New York City.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter

THE LINNAEAN FERN CHAPTER.

PRESIDENT, A. A. EATON, SEABROOK, N. H.

Secretary, W. R. MAXON, U. S. National Museum, Washington, D. C.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

THE SULLIVANT MOSS CHAPTER.

PRESIDENT, A. J. GROUT, PLYMOUTH, N. H.

Secretary, MRS. ANNIE MORRILL SMITH, 78 Orange St., Brooklyn, N. Y.

Moss students are invited to become members of the Chapter. Address the officers for further information.

WANTS AND EXCHANGES.

Special announcements inserted here, for One Cent a word. No notice received for less than 25c. No charge for address. Mail all notices to the Binghamton, N. Y., office.

WANTED—Copy of Williamson's "Ferns of Kentucky." in good condition. Address The Fern Bulletin, Binghamton, N. Y.

WANTED, No. 2, 4 and 5 Linnaean Fern Bulletin, and No. 1 Vol. 4. Will pay a reasonable price for them. Address, Miss E. A. Noyes, 12 Essex st., Newburyport, Mass.

EXCHANGE—Ferns and Phanerogams of the Upper Susquehanna. Send lists. Have *Camptosorus* and *Pellaea atropurpurea*. Want plants of all classes. W. C. Barbour, Sayre, Pa.

FOR SALE—*Montana Mosses*, first fascicle, 50 species, \$3.00; includes species new to U. S. Also Colorado and Minnesota Mosses. J. M. Holzinger, Winona, Minn.

WANTED—Specimens of the less common Ferns. Good exchange given. Send list to W. N. Clute, N. Y. Bot. Garden, Bronx Park, N. Y. City.

THE FERN BULLETIN

VOL. VII.

APRIL, 1899.

No. 2.

WYOMING PTERIDOPHYTES.

BY ELIAS NELSON.

LIBRARY
NEW YORK
BOTANICAL
GARDEN

OUR State cannot boast of a very long list of Pteridophytes. They are of comparatively rare occurrence, and form an inconsiderable part of our otherwise rich and varied flora. However, quite a number of interesting ferns and fern allies have been found within our borders.

The climatic conditions in Wyoming are not altogether congenial to fern growth. Although many ferns are distinctly alpine in habitat, yet it is in regions with much milder and more humid climate, than that of Wyoming, that we find ferns growing luxuriantly. The bleak plains and arid tracts of our State are entirely destitute of ferns, and it is only in the cañons of the foothills and in the mountains that any of these beautiful plants occur. Our ferns are nearly all such as grow in more or less exposed places, in dry soil or in clefts of rock. Growing under much less favorable conditions, they have, as a rule, a much stouter habit of growth than the delicate ferns so common in the Eastern States.

Cystopteris fragilis, our commonest and most delicate fern, occurs throughout the State. It is very frequent in the foothills, and even ascends to comparatively high altitudes in the mountains. Moist, shady nooks under overhanging rocks are its favorite haunts. The two densely tufted ferns, *Woodsia Oregana* and *W. scopulina*, venture out into more exposed ground. Their numerous leaves, rendered rigid by the thickened rachides, stand erect, and form dense masses in crevices of rocks on the lower peaks of the State.

In the cañons of the hills, *Cheilanthes gracilis* clings to perpendicular walls of limestone. *Notholaena Fendleri*, with its finely decompound leaves, white-powdery on the back, was collected in a granite cañon in Laramie county. Seemingly, it has not been reported north of Colorado before. A diminutive form of *Pellaea atropurpurea* grows on the face of shaded walls of limestone in the Laramie range. It has been frequently observed and seems to be worthy of at least a varietal name. It is characterized as follows:

PELLÆA ATROPURPUREA OCCIDENTALIS n. var. Stipes tufted on exceedingly short rootstalks, 1-4 cm. long, purple; leaves simply pinnate with 1-3 pair, 1 cm. long; pinnæ oval or ovate, mostly truncate at base, 6-10 mm. long, 5 mm. broad or less, usually sessile. Collected in a cañon in the Laramie Hills by Prof. Aven Nelson and the writer in 1896, June 13, No. 1919.

The bracken, *Pteris aquilina*, has been found at several sub-alpine localities in the State, and grows most luxuriantly in moist "quaken asp" groves, where the soil is rich and loamy. It attains a considerable size, the large, handsome leaves together with the stipe often measuring six feet in length. *Notholaena sinuata* and *Dryopteris Lonchites* occur high in the mountains. The latter is a beautiful plant as it grows on some moist, grassy slope. The rock-brake (*Cryptogramme acrosticoides*) grows in dense tufts among rocks. *Asplenium Filix-femina* and *A. viride* are from the western part of the State. The latter is a delicate little plant, and is found at high altitudes in the Teton Mountains.

Of the fern allies, the scouring rushes, *Equisetum variegatum*, *E. lævigatum* and *E. hyemale*, are found in meadow land along streams. The last is very common on the Laramie Plains. *Equisetum arvense* prefers the wooded banks of small streams in the foothills. Its variety, *alpestre*, is found in similar locations, but at higher altitudes. *Equisetum robustum* occurs occasionally in moist "quaken asp" groves in the hills. *Selaginella rupestris* is frequent on bare ridges and in dry rocky valleys.

The above named species of ferns and fern allies are represented in the Herbarium of the University of Wyoming, and have nearly all been collected by Prof. Aven Nelson. A few others, besides, are known to exist in the State. *Pellaea Breweri*, *P. densa* and *Dryopteris spinulosa* are reported from the Teton Range; *Isoetes Bolanderi* and *Botrychium Coulteri* from Yellowstone Park; and *Onoclea sensibilis* from the northeastern part of the State. This makes in all twenty-five Pteridophytes for Wyoming. Future collections will undoubtedly add a few more to this number.

University of Wyoming, Laramie, Wyo.

Mr. F. G. Floyd was fortunate enough, last summer, to find a large clump of *Dicksonia punctilobula* containing hundreds of plants all crested in a very beautiful manner. Further mention of this find will be made in our next issue.

THE FIELD HORSETAIL.

BY C. F. SAUNDERS.

IN late March, in the neighborhood of Philadelphia, the Field Horsetail (*Equisetum arvense*) puts up its first modest spikes.

Like most of us, it seems to have a fondness for watching "the cars go by," and is never better suited than in the loose soil of railroad cuts and embankments, or in the cinders of some old siding. Wild flowers are not so abundant these early spring days that we need begrudge our unobtrusive little friend a few moments' attention.

The stalks that appear in March are the spore-bearing ones and are without branches. They are of a warm flesh color, banded at intervals of an inch or so with brown-tipped, jagged sheathes of white. The stems are very succulent and translucent, so that if we gently stretch one lengthwise, the bubbles of air inside may be seen running briskly up and down after the liquid, like the bubble in a spirit-level. If the stem be stretched to the breaking point, the watery fluid spurts out. Surmounting the stems are the cone-shaped spikes which hold the spores. While young these spikes are a beautiful sage-green color, which, as the spores ripen, becomes suffused with orange-yellow, and finally



Equisetum arvense L., collected near Philadelphia, April 17, 1898. *a.* Fertile stem and mature spike. *b.* Young sterile stem with budding branches. *c.* Remains of dead stem of previous year. *d.* Portion of perennial rootstock.

turns to a yellowish-brown. If we break a closed cone across so as to get a transverse view, we shall see the spore cases clustered beneath the tiny caps to which they are attached, and looking a good deal like sets of miniature molars, with broad, shallow crowns and stout roots exposed. Later, after the spores have been discharged, the snug, compact cone becomes a grinning skull of emptiness, wherein the white, broken sporangia gleam for a while like fangs in distended jaws.

If we lay a mature but unopened spike upon a piece of paper, the sporangia will shortly open and drop upon it myriads of powdery green spores. It requires a microscope to reveal the peculiar structure of these minute bodies. Each of them is enwrapped with two tiny straps called *elaters*, which coil and uncoil under the alternating influences of moisture and dryness. If, now, we breathe a long breath upon our heap of spores, a scene of liveliest activity ensues, of which even a pocket lens may enable us to be witnesses; for all the little straps are set twirling by the moisture and in a moment the whole mass is jumping, squirming and twisting, like a disturbed ant-hill.

As the fertile stems mature, the sterile shoots begin to push up into the light and air—green little sprouts, with ruffled whorls of budding branches. These do not attain their growth until some time after the fertile shoots have vanished from the earth. By following the stems down to their points of origin underground, we shall find that both sorts spring from the same subterranean stem or rootstock—the perennial portion of the horsetail—and in reality form with the rootstock parts of one organism. Different in aspect and character, the two kinds of stems also perform two quite different functions—the fertile living merely to produce spores and then quickly withering away, while the sterile, which are more persistent, labor throughout the spring in the workshop of their green branches to manufacture the plant's nourishment for the coming year. The food supply thus accumulated and stored away in the underground stem, keeps the perennial part of the plant alive during the fall and winter, and provides the fertile shoot with energy wherewith to fulfill its life-office in the chill days of early spring.

The range of *Equisetum arvense* extends throughout North America from the latitude of Virginia northward to the Arctic ocean, but is most abundant eastward. It is also a denizen of Europe and Asia. In England, where it is often a good deal of a

pest in grain fields and pastures, it goes by numerous local names, as, for instance, Bottlebrush (because of the resemblance of the sterile shoots to that utensil), Colt's-tail (as though in recognition of this species' modest size, Frog or Toad-pipes (from its habitat in damp places such as frogs frequent and pipe in), Scrubgrass (from its use in scouring dishes, though this name is more specifically applied to *E. hyemale*), and Cat's-tail (doubtless because the good folk of the shires where this name is current see a greater resemblance in the plant to Pussy's caudal appendage than to Dobbin's),

Philadelphia, Pa.

A NEW SPECIES OF SELAGINELLA.

BY A. A. EATON.

THAT what has passed for *Selaginella rupestris* was really a composite species has long been the opinion of thinking botanists who have seen representatives from different sections of the continent, especially from the western part. The able monograph of Prof. Underwood (*Bull. Tor. Bot. Club*, vol. 25, pp. 125-133) is justly considered a good beginning of the task of unraveling the tangle. That is but a beginning, however, and that several species may yet be expected from the southwest border is clearly indicated by the author, and is the opinion of the present writer, who has observed growing or possesses specimens of various other forms. One of these, sent by Miss L. F. Kimball, of National City, Calif., is clearly entitled to a place with the new species recently brought out:

SELAGINELLA CINERASCENS n. sp. *Stems* slender, .6mm. in diameter, prostrate, rooting the entire length, with short lateral branches, at length ramifying till a dense tuft is formed, when the fruiting spikes appear. *Leaves* linear lanceolate, acutish or obtuse, appressed, rigid, 1-1.5mm. long, cineraceous, slightly grooved, those on primary stems flat, the others concave, with 6-8 very minute divergent or erect spines on each side. *Spike* short, twice the diameter of the stem, four-ranked, its scales broadly ovate, acute, conduplicate. *Macrospores* pale lemon with prominently winged commissures, the lower portion honeycombed with rope-like ridges, the upper facies papillose. *Microspores* usually on separate spikes, dark-orange, with prominent spinules. On bare ground, National City, Calif., Miss L. T. Kimball.

Nearest *S. mutica* D. C. Eaton, but the stem is not so stout, the ramifications shorter and more dense, the color lighter, leaves destitute of lateral hairs, glomerate at the ends of the branches. The fertile scales are broader at the base and boat-shaped, squarrose when ripe. I have not seen the spores of *mutica*. It seems strange that authors do not take cognizance of the differences in spores of *Selaginella*, when such an authority as Al. Braun attests to their extreme diagnostic value.

Rupestris, for instance, has them nearly round, without commissural ridges, finely alveolate or pitted; *cinerascens* has them with very broadly-winged commissures and reticulations reminding one of *Isoetes Engelmanni*; while in *Bigelovii* they are finely granular, with very low commissures. No doubt all the other species of this group have characteristic spore-sculpture, but the fruiting material is not at hand to determine.

Seabrook, N. H.

VARIATION IN POLYPODIUM VULGARE.

BY MRS. E. G. BRITTON.

SOME ONE has said of the Hart's-tongue: "O, how wondrously you vary, *Scolopendrium vulgare*." The same might be said of the common polypody, though it seems to be more freaky in Europe than it is with us. Quite recently Mr. George D. Hulst has presented us with specimens of two varieties of it from Lake George, found growing in a secluded locality which he has bought for his summer home and intends, if possible, to keep from the hand of the marauder. The tallest and least variable fronds simply fork once or twice at the apex, and are an incipient form of the variety *cristatum*. The other specimens are shorter and broader than the normal fronds, and each pinna is divided or lacinate more than half the way to the rachis, making the frond deeply bi-pinnatifid. This is the variety *cambricum*, so called because it was originally found in Wales. This variety has been collected at Rock City, Dutchess county, N. Y., by Charles H. Peck, in April, 1892; at West Goshen, Connecticut, in 1890 and 1891 by Prof. Underwood, and between Shandaken and Bushnellsville, N. Y., by Miss M. F. Miller. Prof. Eaton had one specimen in his herbarium collected by Miss Moncks at Cold Spring, N. Y., so that it is still rather rare and local, and always occurs barren, whereas the variety *cristatum*, as collected by Mr.

Hulst, bears fruit dots. Both varieties are cultivated, and fourteen others have been enumerated from fern collections in Europe. *P. vulgare* var., *angustum* Müll., was collected by me at Hancock, N. Y., in 1874, and by Miss Vail at Onteora in 1891. It has long-acuminate-serrate pinnæ. A peculiarly narrow variety with short, blunt pinnæ occurs in the Black Hills at 5-6,000 feet elevation, and has been determined by Mr. Rydberg as var. *rotundatum* Milde.

New York City.

TUBERS OF NEPHROLEPIS.

BY J. BIRKENHEAD.

IN the January, 1899, number of THE FERN BULLETIN this peculiar and, so far as ferns are concerned, unusual mode of reproduction was referred to by your correspondent, Mrs. J. M. Milligan. I am very doubtful about the fern referred to in this lady's notes as bearing a number of corm-like growths, being *N. exaltata*. During a thirty years' experience amongst ferns I have never come across a plant of *exaltata* with tubers. Neither do I find a reference by any authorities whose works I possess to the tuber-bearing characteristic of this species. I am strongly inclined to believe that the fern referred to by your correspondent is really *N. tuberosa*. Because, probably, of its erect growth this fern is very frequently mistaken for *exaltata*, the latter species, however, being quite distinct from the former, very much stronger in growth and having broader and much more massive fronds. *Exaltata* is frequently 5 to 6 inches in width of frond, more glossy, more pointed in the pinnæ, and different from *tuberosa* in its fructification.

In addition to *tuberosa* there are several other *Nephrolepis* which have this characteristic of producing tubers on their roots. *N. Philippinensis* produces them in profusion; so also does *pluma*, which is a deciduous kind; *Bauseii*, a very beautiful variety of the preceding, also deciduous; and *undulata*, likewise deciduous. A peculiar feature about these deciduous kinds is that the plant of one season does not always grow again from the old caudex, but there is in many cases a tuber formed close to the old caudex, from which growth commences in due course the following season. The other tubers formed on the roots at various distances away from the main stem also commence growth and pro-

duce plants. A short time ago one of our men drew my attention to one of the stolons or cord-like runners of a plant of *N. undulata* which had crept over the side of a pot and run several feet on the surface of the stage, which was covered with ashes, and every few inches roots had been emitted, and on the roots numbers of tubers had been formed, so that there was quite a string of them in bunches. These tubers were as usual collected, put in soil, and in due time they will produce growth and make plants of nice size in a short time.

You ask if your readers can furnish you with other instances of ferns bearing tubers. There is one only, apart from the *Nephrolepis*, that I can think of as tuber-bearing, and that is *Adiantum diaphanum* or *setulosum*. This produces in some instances a large number of very tiny tubers on its roots about the size of a mustard-seed. I have seen a cluster of fibrous roots bearing twenty to thirty tubers in a length of three or four inches, not all on one root of course, but on the various fibres branching off from the main root. This species produces a large number of plants on its roots, as also does *Adiantum amabile*, but in the latter species always and in the former very often I have failed to detect indications of tubers where the plants are attached to the roots, and it would seem as if their origin was from buds rather than from tubers. In the case of *diaphanum*, however, the tubers often produce plants.

In concluding these somewhat lengthy remarks, it may be mentioned that there are a number of other *Nephrolepis* besides *exaltata* which do not produce tubers.

Fern Nurseries, Sale, Manchester, England.

CRYPTOGRAMME ACROSTICHOIDES.

I HAVE just returned from the summit of the Olympic Mountains, and I found at the base of a mountain, at an altitude of more than one thousand feet, a beautiful specimen of *Cryptogramme acrostichoides*. At the summit this plant grew in abundance, but not at the base. This was the only plant seen below. Upon examination I found that the large rock upon which the plant grew had rolled down from the summit and had been in its present position for years, as shown by its depth in the ground and also by the moss. This shows that the plant had adapted itself to its new environment. It was larger than the average

found at the summit, but I doubt whether the spores would be as fertile. I have transplanted quite a number of alpine flowering plants, and find that while the plants grow much larger, the flowers are not brilliant; neither are the seeds, as a rule, good.

This fern is quite abundant on the moraines around Mount Tacoma. It may often be seen stealing a ride on the moving glaciers. I have never seen it growing anywhere except among loose rock and ledges. It grows at an altitude of about four or five thousand feet. No tourist ever passes by this dainty denizen of the rocks without wondering what kind of a plant it is that finds a congenial home in such a barren place.—*J. B. Flett, Tacoma, Wash.*

EXTENSION OF RANGE FOR ASPLENIUM VIRIDE.

THE occurrence of *Asplenium viride* in Wyoming, reported by Mr. Nelson in this number, extends the range of that species so far in the Western States that we were induced to write for further particulars to Mr. T. S. Brandegee, who collected it. Hitherto the fern had been found in the West in British Columbia only, until its occurrence in the State of Washington was recently noted by Mr. Flett. Mention of this was in type before Mr. Brandegee's note was received and is published elsewhere in this issue. Fronds of the plants collected in Wyoming, which prove to be good *Asplenium viride*, were sent us by Mr. Brandegee, who writes: "If the specimens are correctly determined, I have the same species from Oregon, collected by Howell, and from the Cascade range east of Mt. Ranier in Washington, collected by myself and identified by Mr. Canby at the time." This species closely resembles *A. Trichomanes*, and it may happen that it has been so identified by other collectors, although the two are very easily separated, the rachis in *Trichomanes* being black or brown, and in *viride* green. Those who have specimens of either, from the Western States, would do well to examine them again. Perhaps the range may be still further extended.

A SUGGESTION FOR STUDY.

IN Moore's "Nature Printed Ferns" that author names and describes thirty-one varieties of *Asplenium Filix-femina* as native to Great Britain alone, while as many more are said to be recognized on the Continent. As yet very little has been done toward working up the various forms of this species to be found

in America, although Prof. D. C. Eaton went so far as to select five forms which he distinguished by varietal names, and Mr. Davenport has added one or two others.

I propose during the coming season to make a special study of this species, and would ask the coöperation of all members of the Fern Chapter. Whenever a member goes out for a botanical ramble, I would ask him to examine every clump of *A. Filix-femina* that he meets with, and to gather full fronds of anything that strikes him as being in the least unusual or peculiar, and press the same, with label inserted, giving date when gathered and character of the habitat; whether wet or dry, in the woods or the open, etc., etc. Then if he will send me specimens, he will receive credit for anything new and distinct in the monograph, and I will respond with some other species desired by the sender, if possible, or will return the specimens after use if desired.

It seems to me that work of this kind should be one of the main objects of the Chapter. Hitherto, our work has been rather desultory and one-sided, as it must necessarily be when pursued individually and alone. One person can only investigate a limited area of territory at the best. But by acting in concert, with members scattered all over the Union, we can accomplish much more definite results. The forms, even, of the same species, growing in one locality, are apt to differ considerably from those growing in a different locality; and by concerted effort we can bring these forms together so that they can be compared and differentiated, as has been done in the older countries of Europe. In no other way is it likely that our list of varieties can be materially increased, at least of ferns east of the Mississippi. Possibly also some new species might be brought to light.

I shall be glad to assist any other member who may take up a specialty, by sending specimens from my own locality.—*B. D. Gilbert, Clayville, N. Y.*

It is usually considered a difficult thing to make the various species of *Lycopodium* live in cultivation. *Lycopodium lucidulum*, however, seems to be an exception to this. Mr. Percy Wilson informs us that he has had a plant of this species growing in water for a year; the plant continues to grow and has now formed sporangia.

THE TURKEY-FOOT FERN AGAIN.

IT is hardly fair for the man of science to hold the novelist strictly to account for his botany, but he may be permitted to speculate upon it. If the reference to the Turkey-foot fern in our last issue has not settled the question regarding the application of the common name, it has opened a pleasant field for discussion, and we make room for two more communications on the subject:

"Mention of this fern occurs in another of Dr. Weir Mitchell's novels, 'Far in the Forest,' when one of his characters is made to say: 'Why, she don't hardly know a pine from a poplar, and when I told her last week that the Turkey-foot fern was a heap more like peacocks than turkeys, she never knew what I meant.' This comparison probably has reference to the spreading tail of these fowls. And the Ostrich fern (*Onoclea Struthiopteris*) naturally suggests itself as being the fern meant. 'It is a fern of noble sort,' says Prof. Wood, and this would tend to confirm Dr. Mitchell's memory of it, 'that it was called the Imperial fern.' Undoubtedly it was the fertile fronds of the *Onoclea* that suggested the name of Turkey-foot to the common people, and the resemblance of these fronds is so close, in the two species, that an untrained eye would hardly detect their difference; hence we would have *O. Struthiopteris* as the 'Imperial' or peacock fern, and the lower and more humble *O. sensibilis* as the Turkey-foot. It appears to me that nothing could be more suggestive of a turkey's foot and leg than these stiff, dark-brown stipes, and moniliform divisions constituting the pinnæ, and at a little distance looking not unlike the heavy scales and markings on the feet and legs of turkeys. The sterile fronds of *O. sensibilis*, with their long, sinuous divisions, are also suggestive of the feet of some large bird. This is my guess. Who has a better?"—*James A. Graves, Susquehanna, Pa.*

"The new bracken coming up in solitary stalks of green, their summits not the fiddle-head of the ordinary fern, but resembling rather the incurved, three claws of a large bird' (William Black, in 'Yolande'). This sounds much like Turkey-foot, but of course is not conclusive. *Pteris aquilina* is immense in its growth here, and is putting up these 'claws' through the season. Dr. Mitchell must have been surprised to be called up on his botany."—*Mrs. Stephen Knowlton, Danville, Vt.*

THE BIRTH OF A FERN.

STARTING then from a spore, we all know that each species of fern bears a harvest of these, distributed in its own special way upon the backs of the fronds or upon portions of fronds specially modified to bear them. These spores are extremely minute bodies, usually brown in color, though sometimes, as in

the Osmundas, green, and contained in small stalked capsules which occur in clusters of various shapes. In the Polypodies these clusters, heaps or sori (*sorus*, a heap), are round and uncovered, but in most species the heaps are protected by some sort of covering or indusium. The spore capsules, when ripe, burst open very suddenly and expel the contained spores to some distance; a few fresh capsules scattered on the field of a microscope can be seen exploding like so many bomb-shells, scattering their bullets in all directions. If now we place a few of these spores on a damp piece of clay and cover them with a glass, in about a fortnight in warm weather we shall see them, under a lens of course, protrude a small green projection, a cell containing chlorophyl, the active principle of all green vegetation. This cell proceeds to multiply itself, splitting up and forming others, first in a straight row of four or five, from several of which the first root hairs will proceed, anchoring it as it were to the clay and absorbing any nourishment they can get at the same time. Presently, however, they begin to spread sideways as well as forward, and in a week or two the familiar heart-shaped scale will be completed. Meanwhile, upon its under surface, first of all among the numerous root-hairs, a number of tiny pimple-like bodies will have appeared; these are the antheridia or male organs, and later, close to the indentation of the heart, a small cluster of longer ones originate, which are the archegonia or female organs. Both these classes of organs are usually immersed in the dew-like moisture that collects upon the under side of the prothallus under congenial conditions of growth, and in due time the antheridia burst and throw out an immense number of extremely small tadpole-like bodies, which swim actively about and make their way to the archegonia. At the base of each archegonium is an egg-cell; this is fertilized by contact and at once proceeds to split up into other cells, to swell and in time to send down a root proper into the soil and a primary frond into the air, and the fern is fairly launched on its career. It will have been observed that a cluster of seed-cells is formed on each prothallus, but though twin plants are by no means rare, only one of these cells usually produces a plant, the prothallus seeming incapable of supporting a number through the initial stages. It has, however, been shown that by cutting the prothallus through the cluster and so to some extent isolating the cells, each piece will produce a plant. In some species, too, the prothallus buds

out into other prothalli. *Osmunda regalis* does this, and *Pteris aquilina* occasionally; each prothallus then produces a plant so that a single spore yields quite a crop. In 1874 Professor Farlow discovered that in *Pteris cretica* the prothallus produced the fern by simple budding and without sexual action, and Professor DeBary following this up, established the singular fact that our well-known crested Male fern always produces its youngsters in this fashion, its name being curiously enough justified by the constant absence of the female organs. This is called Apogamy or suppression of marriage. The next discovery was that of Apospory by myself in 1885. This, as you know, consists in prothalli being developed directly from the frond without the agency of the spore. A very beautiful form of the lady fern had been observed for twenty years to produce abortive spore heaps and consequently all attempts at raising it had failed. Certain discoveries of mine in connection with the bulbils of other ferns led to pinnæ of this fern being sent to me. I pegged the material down, kept it close and watched it. To my surprise it began to grow vigorously at once and in course of time produced dense clusters of irregular prothalli all over the backs of the pinnules. Early in the following May a crop of young ferns made its appearance, and in June I exhibited them at the Linnæan Society and described their genesis.—*Abridged from a paper by Charles T. Druery before the British Pteridological Society, 1895.*

A CORRECTION.

IN reading the proof of the reprint from my Bermuda ferns, in the last number of THE FERN BULLETIN, we all overlooked the fact that no name was given to the fern described. The name should have been given as *Acrostichum lomarioides* Jenman. I noticed the omission the moment my eyes rested on the article in THE FERN BULLETIN; but, like the proofreader, I seemed oblivious to the absence of the name in simply reading the slip of proof.

In a letter recently received from Mr. Jenman, he says: "*Acrostichum lomarioides* Jenm. is a very distinct and robust species compared to *A. aureum* L., both of which are very abundant here (*i. e.*, in Demerara) in the swamps of the coast lands. All the characters are different, not only in part, but the *whole*. It is frequent, too, in the West Indies."

Our southern botanists should now hunt up this species in Florida and give us some definite stations for it. The one on "St. John's River," given by Eaton, is rather too vague to be satisfactory.—*B. D. Gilbert.*

OUR MISCELLANY.

Mr. J. B. Flett, of Tacoma, Wash., has recently collected specimens of *Asplenium viride* in the State of Washington near the international boundary line. The fern has been known from British Columbia, but this appears to be the first time it has been collected farther south in that part of the world. Mr. Flett also found excellent specimens of the variety *dentata* of *Cystopteris fragilis*.

Perhaps some facts concerning *Aspidium mohrioides* may be interesting. I have found plenty of it on the high mountains of the Cascade range east of Mt. Ranier, and was pleased to have it sent to me last year from the vicinity of Dawson in the Klondike region, where it was found by Mr. John McLean. Dr. C. H. Purpus has collected *Notholaena tenera* from Piute Peak, about the southern end of the Sierra Nevada and south of Mt. Whitney. —T. S. Brandegee, San Diego, Calif.

Woodwardia areolata is a fern in which there is no doubt about the presence of an indusium. Before the spores are shed, it is thick and leathery in texture, and probably adds quite a little to the weight of the fertile frond, which is noticeably heavier than a sterile one. In the majority of ferns, when the spores are shed, or even before, the indusium withers, but it is not so with this species. The fertile fronds remain erect for a part of the winter at least, and the indusia assume a corky appearance, each being wrinkled transversely in several places. They also become much broader and so bulky that the pinnæ seem nearly an eighth of an inch thick.

We are all familiar with the curious antics of the ripe spores of *Equisetum* when viewed through a microscope. When moistened by a breath, the elaters coil round the spore, and as the moisture evaporates, they quickly spread out again in a remarkably animated manner. It does not seem to be generally known that the same phenomena may be observed with the naked eye, but if one will shake upon the back of his hand a quantity of the spores from the cone-like spikes at just the right time in their growth, he will suddenly see the sage-green mass appear to boil, becoming at the same time fluffy and lighter in color, due to the opening elaters. The spores are too small to allow us to see the process in a single spore, but in the mass the effect is quite noticeable.

EDITORIAL.

FUTURE FERN STUDY

There are not a few of us who vainly imagine that when we have learned the name of a fern and pressed some specimens of it, that we have got pretty much all of interest that the species has to offer. This opinion has long prevailed. Reference to any serial publication devoted to botany will show that our fern students and collectors have mainly been employed in making lists of ferns, rather than in studying the plants themselves. It seems only by the merest chance that anything interesting has slipped into print. To find a rare fern in one's own locality has counted for more in the fern lover's estimation than to discover a dozen curious facts about a common fern. It is probable that more energy has been spent in searching for the walking fern or the smaller *Aspleniums* than would have sufficed to bring to light many interesting things in our familiar species. And yet it is this latter kind of study that has brought us the most valuable results. Apospory was first discovered in the common *Asplenium Filix-femina*, and apogamy in *Pteris*. It was also this same close study of common ferns that brought to light *Dryopteris simulata*, which until a few years ago had been overlooked and trampled under foot in the hunt for rarities. Let the fern-lover who has been inclined to consider his locality exhausted of new things, turn his attention to a closer inspection of the nearest species, and he will find the field for original work limitless. The discovery of new species of ferns in America is practically at an end; the study of the ferns as living things is just beginning. To learn the names of the ferns is merely to become familiar with the alphabet of fern study.

* * *

THE FIRST FROND

The message of Spring comes early to the ferns. He who would see the first frond unroll must not wait for the woolly "fiddle-heads" of the cinnamon fern in the plashy pastures. In mid-winter the fronds of some species begin to grow. Last January we saw a half-developed frond of the ebony spleenwort on a bank near the city of Washington, and asked if that were the usual thing, but we venture to say that there are very few who could have enlightened us. Who can say without further examination which species in his locality is first to start into growth in spring and which one

produces the first expanded frond. It is not always the first to start that is the first at the goal. There are handicaps of soil, location, moisture, sun and shade to be taken into consideration. And given equal conditions, is the same species always first in different localities? We shall be glad to notice in this journal any answers to these questions that may be sent us.

* *

A NEGLECTED FEATURE The rarest things in the fern collector's herbarium are specimens of the uncoiling fronds. We have yet to hear of the student who makes it a point to collect them, although the young fronds of each species are quite as characteristic as anything else about the plant. Could any one mistake the green claws of the bracken for anything else? The mature fronds frequently show few traces of the hairs and scales that protect them through the winter, and for this reason, if for no other, a collection of the budding fronds would be especially valuable.

* *

HYBRID FERN The subject of fern hybrids has occasioned much speculation and engendered many theories, but has resulted in a very small amount of practical work. A long series of experiments in England has shown that varieties may be readily crossed, but this is to be expected, especially in the case of ferns with dioecious prothalli. It is only when we come to the crossing of distinct species that the scientist becomes interested. There are a few recorded cases in which this has seemingly been accomplished with closely allied species, but enough has not yet been done to either prove or disprove the hybrid origin of such ferns as *Asplenium Bradleyi*, *A. ebenoides*, or the peculiar *Dryopteris cristata marginalis*. Yet, if these are hybrids, how easily man, who can control all the necessary conditions, should be able to produce them, when, despite all untoward circumstances, the ferns can multiply naturally. To place prothalli in the best position for crossing, ripe spores of two species should be sown thickly together, and as old spores do not germinate as soon as fresh ones, care should be taken to see that spores of the same age are sown. It is to be supposed that if the ferns hybridize freely in nature, such sowings would give at least a few of the hybrids, and if numerous experiments of this kind failed to produce a single cross, the fact that this is not possible might almost be considered as proven. On the contrary,

a single plant showing characteristics of both plants but like neither, should prove the reverse. Hybrids are well known to be sterile, and if after repeated trials, spores from supposed hybrids failed to germinate, this would go a long way to prove such hybridity.

* *

FERN
VARIETIES While comparatively little scientific interest attaches to the finding of obscure varieties in the wild state, it cannot be denied that the fern cultivator may get much pleasure from a collection of such forms. The one who finds a wild variety has something unique, and may derive a certain satisfaction from the knowledge that the form is entirely his own. If he chooses, he can multiply the find as many times as desired, for spores of such varieties will produce plants like the parent. Indeed, it is said that spores from an abnormal part of a frond will reproduce the abnormality in the new plants. As yet, this branch of fern-growing has received little attention in America, although a collection of such forms would add an attractive feature to the fern garden. Those who have about exhausted the possibilities of finding species new to their locations, might find in the search for varieties a virgin field for their efforts.

NOTES.

—In an article upon the extent of dodder parasitism, in the *Plant World* for May, 1898, Mr. E. J. Hill mentions *Onoclea sensibilis* and *Dryopteris thelypteris* among the list of host plants.

—G. A. Woolson, in *American Gardening* for January 14th, claims that *Dryopteris patens* is hardy in Vermont, a plant set out by him having wintered in that latitude. A life-sized nature print of the sterile frond is given.

—The report of the seventh annual meeting (1898) of the British Pteridological Society has just been received. It contains the three papers presented at the meeting, namely, "Ferns as Pet Plants," "Fern Growing in the Towns," and "Polystichum Angulare proliferum, past, present and future." Charles T. Druery, F. L. S., one of our valued contributors, was elected president of the society for the current year.

—It has long been believed that the forms of *Selaginella* in America which have been referred to *S. rupestris* would be found

to consist of more than one species if suites of the specimens were studied. Having consulted the largest collections of this genus in both Europe and America, Dr. L. M. Underwood is convinced that instead of a single species we have no less than nine, and one variety. His observations are published in the *Bulletin of the Torrey Botanical Club* for March, 1898. Six species and one variety are described as new, one variety has been raised to specific rank and one species—*S. Oregana*—has received its rightful name of *struthioloides*. Of these species we have but two in northeastern America—*S. rupestris* and the rare *S. tortifolia*, the latter reported from the Carolinas only. *S. rupestris Fendleri* is found in Colorado and New Mexico; *S. Watsoni* in "the high altitudes of the Sierra Nevada and neighboring mountains;" *S. mutica* in Colorado, Arizona and New Mexico. *S. arenicola* (described in the paper as *S. arenaria*) is reported from Florida and Texas; *S. rupicola* from New Mexico, Arizona and Mexico; *S. Bigelovii* from California; *S. struthioloides* from Oregon, and *S. extensa* from Mexico.

—C. W. Hope, of England, writing of *Asplenium Glenniei* Baker, in the *Bulletin of the Torrey Botanical Club* for February, is inclined to consider the plant collected for this by Lemmon in Arizona as identical with another species, *A. exiguum* Bedd, of the Himalayan mountains. At present the data for the occurrence of *Glenniei* in the United States rests with the Lemmon specimens. *A. exiguum* is a common species in the Himalayan region. It is prolific on the pinnae throughout and also at the apex. The American specimens from which *A. Glenniei* was first described were not prolific, but the Arizona specimens are said to exactly resemble the Himalayan fern in this respect. If the two are found to be the same, then *A. exiguum* being the older name, will have to be adopted for our plant. The author says of *exiguum*: "It spreads itself out like a star, the prolonged fronds bending backward until they hang their tips in the moss, seeking for cracks or crevices or earth in which to root. The fronds last for two years at least, living through the winter in frost and snow, and through the succeeding dry, hot season in a shriveled and apparently dead state until the rainy season comes in June or July, when they uncurl, and then frequently, if they have not already done so, produce young plants on their tips or on their pinnae. This is followed by the springing up of fresh fronds from the same roots which are not generally prolific in that season."

BOOK NEWS.

Bradford Torrey always writes entertainingly, and a new book by him needs no fresh praise for its literary merits. In "A World of Green Hills"* the reader is given enchanting glimpses of nature in North Carolina and Virginia in early spring. The author visited the region primarily to study the birds, of which he found many rare ones to interest him, but the wild flowers were too attractive to be overlooked, and both are blended in this book, which all lovers of out-doors will delight to read.

"The Plant Baby"† is a book on botany that little folks will appreciate. While primarily intended for the use of teachers in the lower grades, it is written in simple, untechnical language that any child of five can understand. Beginning with the plant in its "cradle," as the seed is called, the subject is gradually developed until without conscious effort the child has learned how plants grow, how they get their food, how the flowers are constructed and many other facts which the beginner needs to know. The book is profusely illustrated, well printed, and, with the exception of an occasional slip in the text—as when it is said that seeds which have lain in the pyramids for centuries have afterwards germinated—is well written.

An interesting collection of poems dealing with the various phases of nature has appeared under the title of "Poetry of the Seasons."‡ The book is designed for "grammar schools and home libraries." While it seems to meet the requirements of the former admirably, it may be questioned whether the omission of several of the better known American poems will make the collection as acceptable to the general reader. The compiler's greatest fault seems to be a tendency to draw upon the "minor poets;" but there are doubtless many, familiar with the others, who will value the book for this very reason. On the whole the collection is one of considerable merit, since it contains some three hundred poems representing the work of one hundred and seventy English and American authors. The poems are grouped under the four seasons. There are four full-page illustrations and numerous others in the text. The type, paper and press-work are exceptionally good.

*"A World of Green Hills," by Bradford Torrey; Houghton, Mifflin & Co., Boston and New York, 1898. 16-mo., 282 pp., price \$1.25.

†"The Plant Baby and Its Friends," by Kate Louise Brown; Silver, Burdett & Co., Boston, 1898. 8-vo., pp. 155, introductory price 48 cents.

‡"Poetry of the Seasons," compiled by Mary I. Lovejoy; Silver, Burdett & Co., Boston, 1898. 12-mo., 336 pp., introduction price 60 cents.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—Mr. Alvah A. Eaton, Seabrook, N. H., wishes to hear from all who find *Equisetum pratense* this year. Drop him a postal.—C.

—Mr. Will R. Maxon, our efficient secretary, has accepted a position in the U. S. National Museum, Washington, where letters for him should be addressed.—C.

—Alvah A. Eaton offers specimens of *Ophioglossum arenarium* E. G. Britton, for five cents, and type specimens of *Botrychium tenebrosum* A. A. Eaton, for eight cents, or both for ten cents.

—The revised constitution will be published in the annual report, soon to be issued. This will also contain a list of the members of the Chapter. Any changes of address should be reported to the secretary at once.—C.

—The Chapter herbarium will not make it less desirable to gather liberally for others. The large number of specimens taken in each distribution shows that many herbaria are far from complete yet. People wish to *own*, even if they can borrow.—E.

—The report containing the papers read at the Boston meeting has just been published, and it may be had by addressing James A. Graves, Susquehanna, Pa. The price is twenty-five cents. Members of the Fern Chapter may obtain copies at 15 cents each.

—Members are solicited to keep the Chapter herbarium in mind and gather specimens for it. The president places his whole local herbarium temporarily at the use of members. For conditions see the officers' reports. Letters about specimens, etc. must be accompanied by postage to secure a reply.—E.

My *Osmunda Claytoniana* clumps are thirty years old, and many fronds have seven pairs of fertile pinnae.—Mrs. A. D. Moore, Corning, N. Y.

Miss Edith Bates writes that among a collection of Japanese ferns recently received by her, there is a plant of *Camptosorus Sibericus*, two fronds of which have taken root at the apex and produced new plantlets.

THE BRYOLOGIST,

A DEPARTMENT OF THE FERN BULLETIN,

DEVOTED TO THE STUDY OF NORTH AMERICAN MOSSES.

ISSUED QUARTERLY.

EDITED BY DR. A. J. GROUT, PLYMOUTH, N. H.,

To whom all correspondence regarding the mosses should be addressed.

This department is issued separately at twenty-five cents a year. Subscriptions should be addressed to the Fern Bulletin, Binghamton, N. Y.

VOL. II.

APRIL, 1899.

No. 2.

ALL correspondence intended for the editor should be addressed to 175 Halsey Street, Brooklyn, N. Y., until July 1st, '99.

* *
* *

THE editor takes pleasure in announcing that the promised illustrated glossary of bryological terms will be begun in the July number of the BRYOLOGIST. Mr. H. N. Dixon and his publisher have very kindly permitted us the use of the drawings in the first five plates of Dixon and Jameson's Handbook of the British Mosses. The editor considers this book to be the best moss manual in the English language, and as it includes a majority of our mosses of Northeastern America it is almost indispensable to the student who wishes to know our mosses well.

PREPARATION OF MOSSES FOR EXAMINATION WITH THE COMPOUND MICROSCOPE.

MOST of us who have studied mosses for some time have come to use by imitation or discovery, some methods of manipulation which may be useful to others. The editor would be glad to have others send notes on this subject in addition to what he presents here.

If the moss be fresh and moist it is all ready for operations. Dried specimens should be softened by boiling. The parts to be studied can be boiled in water on a slide by holding it over a lamp, but it is much better to boil the whole plant. An alcohol lamp and tin cup can be used, or if convenient, boiling water can be poured into a cup and the plant placed in this. This also will serve to drive out the air-bubbles that will cling if cold water be used.

One should have the following implements if possible : A pair of fine pointed forceps with comparatively large surface of contact at the points, a pair of small, fine-pointed, sharp scissors, dissecting needles, a sharp scapel or razor and a stick of pith.

The leaves should be removed with the forceps by seizing them near their bases and stripping downward; these are then put in a drop of water on a slide and covered with a cover glass; in this drop of water should be placed also a portion of the branch from which the leaves have been stripped. An examination of this last will show whether the bases of the leaves are decurrent or not and will give a profile view of the leaves that will tell whether there are any teeth or papillæ on their backs. With the hair-caps and their allies and some other mosses, a cross-section of the leaves is often necessary to definitely determine the species. This often seems very difficult to a beginner but is really quite simple unless very beautiful sections are desired. The most common method is to split a stick of pith a little distance and insert a bunch of leaves in the cleft, pressing the sides together with the thumb and finger of the left hand. Then cut thin sections of pith and leaves with a very sharp razor or scapel. The pith should be thoroughly moistened and there should be water on the upper surface of the razor to float away the sections cut. After a number of sections have been made, all the mass of pith and leaf sections should be removed to a drop of water on a slide and the pith and large pieces of leaves should be removed. Pith can be obtained from young elder shoots or the stems of the flowering raspberry, or if nothing better is at hand the pith of a cornstalk can be used. Mrs. Britton thinks this method is "more bother than it is worth for all simple leaf sections," * but recommends it for other sections. She places a number of the leaves side by side in the same direction so that they may be easily held firm with the thumb nail of the left hand—"begin cutting at the tips of the leaves" (using a razor or sharp knife) "moving the nail from side to side and working downward to the lower half of the leaf." I have often used another method with success. Grasp a bunch of leaves between the thumb and forefinger of the left hand and with the scissors (which must be sharp) cut section after section from the bunch as thin as possible, and among the mass of sections will be found some that will show the desired structures. If the leaves are very small, a whole stem or branch covered with leaves can be sectioned without first removing the leaves.

* *Observer* for May, 1894.

To study the peristome and annulus, etc.; if the operculum still remains, remove it with forceps, or dissecting needle, carefully saving it on the slide; cut the capsule lengthwise with the scissors and spread out each half on the slide, one outside up and the other the inside up; or the capsule can be first split and the pieces of operculum removed afterwards. This prevents any loss of minute parts. If the spores obscure the parts, a minute's boiling over the lamp will scatter them. The walls of the capsule will often curl up so strongly as to make it necessary to split them with the dissecting needles to cause them to lie flat.

WHAT ARE MOSSES?

BY A. J. GROUT AND MARIE L. SANIAL.

THERE are at least three different classes of plants which popularly pass under the name of mosses, true mosses, Hepaticæ or liverworts, and lichens. The lichens are gray, yellow, brown and various other colors and shades, but are seldom of true plant green; then, too, they have no true stem and leaves, but may consist of ascending or even pendant (in the case of tree lichens, "hair moss") stem-like divisions or of a flattened thalloid expansion either membranaceous or coriaceous in structure.

There are two species of lichens to which the name *moss* has been popularly and erroneously applied. The first, the hair "moss" (*Usnea*), consists of strong, greenish-gray filaments and resembles a small mane or wig. It clothes the branches of trees and under shrubs in dark woods and is well known to every hunter of squirrels, from its amazing similarity to the tail of a hiding gray squirrel.

The second is the reindeer "moss" (*Cladonia rangiferina*), the great boon of the Laplander. It simulates a grayish crust-like mass of much-branched, rootless and leafless hollow shrubs in miniature, their height being seldom more than two inches.

The liverworts are more likely to be mistaken for mosses, as they belong to the same branch or subdivision (*Bryophyta*) of the vegetable kingdom, and are very closely related. The foliose hepatics have a stem and leaves, and when sterile some forms may be mistaken for true mosses, even by one who has a considerable knowledge of the plants, especially the alpine *Gymnomnium*, which has closely appressed but emarginate leaves and julaceous, erect branches.

In general the leafy hepatics can be distinguished from the mosses by the flattened appearance of the plant, due to a marked differentiation of the upper (dorsal) and the lower (ventral) surface. The leaves also are apparently arranged in two rows overlapping like shingles (imbricated). An exception to this is *Gymnomntrium* before mentioned. The leaves of hepatics consist of a single layer of almost regularly hexagonal cells, without even the rudiment of a mid-rib (except in one or two rare forms,) and they are often bifid or multifid.

If in fruit, the leafy hepatics can easily be recognized by the dark, globular, four-valved capsule borne on a slender, delicate, white fruitstalk and having spiral elaters mixed with the spores.

The true mosses, on the other hand, possess stem and leaves arranged in ranks and while often flattened have a much less marked dorso ventral differentiation. The leaves are never bifid or multifid and the leaf-cells are usually much elongated, seldom regularly hexagonal and in three-fourths of the species possess well-defined mid-rib.

No moss except the rare *Andreaea* has a capsule splitting into four valves but nearly all moss capsules open by a lid (*operculum*), and most have a characteristic fringe of teeth (*peristome*) about the mouth. No true moss has spiral elaters mixed with its spores. In color, mosses, excepting the peat mosses, are nearly all of some shade of green ranging from almost black to a light yellow green.

Any good text-book of botany will give these distinctions with more detail and usually with helpful illustrations.

THE CORD MOSS AND ITS ALLIES.

THERE are several common and interesting allies of the *Dicranums* that would make profitable study, but for variety's sake we will turn our attention to a moss with a double peristome and other characters not before treated in THE BRYOLOGIST.

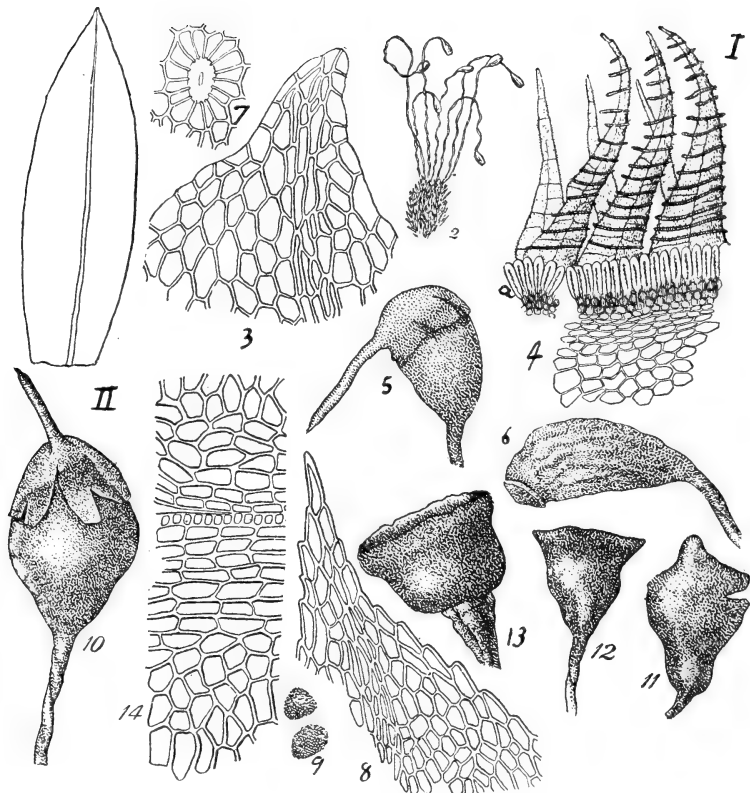
The cord moss (*Funaria hygrometrica*) is so called because of the twisted seta which is very hygroscopic and untwists when moist. Its Latin name, *Funaria*, is derived from *funis*, a rope. This twisting of the seta is not peculiar to this group, however, but is common in many other groups. The cord moss is to be found everywhere, being especially abundant in waste places and on soil recently burned over. I have seen it completely cover the

soil in an old strawberry bed. When mature it is easily recognized by the peculiar looking curved capsule, with its mouth on one side (Figs. 5 and 6). When immature it is much harder to recognize because the capsule is erect and nearly symmetric and the calyptra has not assumed the rakish position indicated in figure 5.

This moss has perhaps been given a more careful study than any other species, and it is the one described in nearly all our text books. There are several other species in the United States, but only this one is likely to be met with by our readers. So characteristic is the appearance of the mature plant that we will give no detailed description, but will refer briefly to the characters not before explained. When the lid is removed there will be seen at the base of the peristome around the outer rim of the urn, two or three rows of peculiar vesicular (bladder-like), thin-walled cells, forming the annulus (Fig. 4 a). If the operculum has already fallen, the annulus will be gone also. It is said to be deciduous. In some species it remains attached to the mouth of the urn and is said to be persistent. The annulus is very highly elastic, and when the capsule is fully ripe it helps throw off the operculum. The peristome consists of sixteen undivided, colored, articulate teeth, and inside of these another row of sixteen thin, light-colored teeth, known as the endostome, each tooth being called a segment or process. In *Funaria* the segments are entirely separate and are opposite the teeth. If the teeth be viewed in profile a sharp projection (appendage) will be seen extending inward from each articulation. The articulations mark the boundary between the cells and the appendage, the thickened wall separating the two cells. These appendages are well shown in Fig. 4.

The spores ripen early in June, and there is not a member of the Chapter who cannot easily collect an abundance of fresh material for study.

The Urn Moss (*Physcomitrium turbinatum* (Mx.) Brid.—*P. pyriform* of Lesquereau and James' Manual), is undoubtedly very closely related to *Funaria*. The figures show us that the leaf structure of one species resembles the other, but to the beginner it will seem strange to classify a moss with no peristome at all as the near relative of one with a double peristome. Yet this arrangement is accepted by pretty nearly everybody who has studied the two carefully, and there are several other similar cases. For some unexplained reason the urn moss seems to have



(The figures below the line I represent *Funaria hygrometrica*; those below the line II, *Physcomitrium turbinatum*.)

I. 1, Outline of leaf; 2, deperculate plants; 3 apex of leaf, showing costa ending below apex; 4, a portion of the mouth of the capsule after the operculum has fallen, showing annulus and peristome; 7, stoma from base of capsule. II. 8, Apex of leaf, showing costa terminating below the leaf-apex; 9, spores; 10-13, capsules in various stages; 14, a section of the mouth of capsule and operculum, showing annulus and transversely elongated cells at the mouth of capsule.

[Taken from Mrs. Britton's *Observer* articles, by permission.]

lost its peristome. There are several species of *Physcomitrium* in the United States, but *P. turbinatum* is by far the most frequent and will be readily recognized from the figures. It is common

in old fields, open grassy places and the like. It is very small and will be easily overlooked. It, also, comes to maturity in June.

Mrs. Britton has given these two species a much fuller treatment in *The Observer*, and has written a monograph of the species of *Physcomitrium* which appears in the *Bulletin of the Torrey Botanical Club* for May, 1894.

The beginner may perhaps confuse species of *Pattia* with the urn mosses, especially *P. truncatula*. In this last species, however, the costa is excurrent, passing out of the apex of the leaf into a short point. The costa is percurrent or excurrent in nearly all of our species of *Pattia*, and in most the leaf cells are papillose. The *Pattias*, moreover, mature their capsules in winter.

MOSES FOR DISTRIBUTION.

THE Splachnaceæ are of our queerest and most interesting mosses. They are usually found growing on decaying animal matter or nitrogen-containing animal excreta. They are, furthermore, remarkable for the extreme development of the apophysis which never occupies less than half of the capsule and in some species of *Splachnum* is greatly enlarged as to become umbrella-shaped, reminding the writer of the hood of a cobra. There are a large number of stomata in the outer wall of the apophysis and a large amount of assimilative tissue within, which goes to show that this grotesque outgrowth is another of Nature's devices to provide nourishment for her lowly children.

For a stamped self-addressed envelope, the following mosses will be sent to members of the Moss Chapter only: Mrs. Britton will send *Tetraplodon bryoides*, an alpine member of this group; Mr. A. A. Eaton will send *Splachnum ampullaceum*; Mr. J. Warren Huntington will send *Buxbaumia aphylla*, which was mentioned in a previous article; Mrs. Emilia C. Anthony will send "the white moss" (*Leucobryum glaucum*), which grows in conspicuous whitish cushions in woods throughout our range. This moss is a near relative of the *Dicranums* as its peristome will show, and it is also remarkable in having its leaves of more than one layer of cells. It is thought by many botanists that these leaves represent the greatly expanded costa, from which the lamina has entirely disappeared. This will not seem improbable to those who have studied the leaves of the long-leaved *Dicranum*.

The Cambridge Botanical Supply Co., of Cambridge, Mass., will send *Brachythecium aspernum* Mitt.

For five cents in stamps A. J. Grout will send *Funaria hygrometrica* and *Physcomitrium turbinatum*.

The above specimens are all fertile. Hereafter when sterile specimens are offered, *st.* will be placed after their names. For addresses see list of members.

THE SULLIVANT MOSS CHAPTER OF THE AGASSIZ ASSOCIATION.

—Our apologies are due to Vice-President Collins for the omission of his name from the list of charter members.

—Only eleven votes were cast in the vote for the constitution, but as they were all affirmative and constitute a quorum, the constitution is adopted.

—The president hopes that no one will think him to be the person referred to in the July BRYOLOGIST as "just the man for the place." The person thus referred to positively declined the honor.

—Fifty members, and more are joining every day. Copies of the constitution will be mailed to any one interested in moss study upon application to the secretary.

—Vice-President Collins sends the following note on mica for slides: "A good grade of mica for microscopic slides can be obtained of Eugene Munsell & Co., 218 Water street, New York City. It comes in square pieces, 2x2, and is readily cut into two slides and two covers with an old pair of shears. It generally comes much too thick, but is readily split to the desired thickness. I obtained a pound of it in March, 1898, and have been using it pretty constantly since, and have two-thirds of it unused now. The price quoted me in March was 51 cents per pound net, less 2 per cent. for cash in ten days, delivered."

—Our secretary sends the following method of preparing mica slides for use, after separating the mica and trimming the pieces into the desired sizes: First—Place the whole in a dish and cover with alcohol and let stand for twenty-four hours. The alcohol need not be of high grade. Wood alcohol, such as is used for burning in lamps, is good enough. Second—Pour the alcohol off, keeping it for such use or for burning, cover the mica with water, in which pour a few drops of hydrochloric acid. Let this stand for several hours, taking care to separate the thin slides in such manner that all may be acted upon by the acid bath. Third—Pour this off and repeatedly wash in *warm* water, by pouring the water on and stirring to insure perfect cleaning. Fourth—Dry by spreading the mica on towels, and when dry polish with lens paper. Finally place in a covered box to keep free from dust.

50 cts. per Year.
15 cts. per Copy.

Vol. VII.

No. 3.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

JULY.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1899.

—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

Articles pertaining to any phase of Fern life solicited.

Communications intended for the editor should be addressed to Willard N. Clute, New York Botanical Garden, Bronx Park, New York City.

If this paragraph is marked, your subscription expires with this number. The journal is not sent beyond the time paid for. An early renewal will keep your files complete. We have no back numbers earlier than Vol. VI.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter

THE LINNAEAN FERN CHAPTER.

PRESIDENT, A. A. EATON, SEABROOK, N. H.

Secretary, W. R. MAXON, U. S. National Museum, Washington, D. C.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

THE SULLIVANT MOSS CHAPTER.

PRESIDENT, A. J. GROUT, PLYMOUTH, N. H.

Secretary, MRS. ANNIE MORRILL SMITH, 78 Orange St, Brooklyn, N. Y.

Moss students are invited to become members of the Chapter. Address the officers for further information.

WANTS AND EXCHANGES.

Special announcements inserted here, for One Cent a word. No notice received for less than 250. No charge for address. Mail all notices to the Binghamton, N. Y., office.

WANTED—LINNAEAN FERN BULLETIN, Nos. 2, 3, 4, 5, 6, 7, 11 and 12; Vol. IV, No. 3, and FERN BULLETIN Vol. V, No. 3. Address T. J. Fitzpatrick, Lamoni, Ia.

WANTED—Fresh fronds, any size, or plants, or prothalli. of 6, 27, 32, 51, 55, 56, 65, 88, 91, 92, 102, 104, 115, 122, 136, 141, 157, 158, 159, 160, 165, 166, 169. Ferns, fern allies, phanerogams, dried or fresh, in exchange. Write for particulars. Address, Miss Margaret Slosson, Pittsford, Vermont.

WANTED—To complete files, Nos. 4, 6, 7 and 12 of the LINNAEAN FERN BULLETIN. Address, Dr. W. G. Farlow, Harvard Univ., Cambridge, Mass.

WANTED—The name and address of any one desiring our list of dried specimens and microscopic preparations of Mosses, Ferns, etc.
Ithaca Botanical Supply Co., Ithaca, N. Y.

THE FERN BULLETIN

VOL. VII.

JULY, 1899.

No. 3.

THE GENUS *EQUISETUM* WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON.

THIRD PAPER.

HIPPOCHÆTE Milde.

STOMATA forming two exceedingly regular rows in the grooves, vertical, separated from each other by regular quadrate cells, lying in a deep depression of the epidermis, overlaid with a silicious plate, which is continuous with the epidermis and penetrated by an irregular opening. Plants not dimorphous; branches with central cavity, first internode always shorter than sheath of stem; spike pointed; rhizome roughened with silicious points. Species not easily separated.

A. *EQUISETA AMBIGUA* Milde.

Rows of stomata in 1-4 lines; plants of various aspect, small or stout, branchless or branched, according to locality or other causes; ridges rounded; sheaths elongate, widened at top; branches at most 4-9 angled.

(8.) *E. ramosissimum* Desf.

B. *EQUISETA MONOSTICHA* Milde.

Row of stomata of 1 line; plants of various aspect, as regards size and branches; ridges convex or grooved.

a. *Equiseta hiemalia* Milde.

Ridges 2-angled; plants almost always branchless; sheaths mostly cylindrical, appressed; teeth mostly deciduous. (9.) *E. hiemale* L. (10.) *E. robustum* A. Br. (11.) *E. lævigatum* Al. Br.

b. *Equiseta trachydonta* Milde.

Ridges angled, very broad, concave; grooves covered with rosettes; sheaths widened, seldom appressed; teeth not deciduous, grooved, rough. Plant branchless in normal condition. (12.) *E. variegatum* Schleich. (13.) *E. scirpoides* Michx.

I E. ARVENSE L.

Stems dimorphous; sterile, somewhat rough, with 6-20 convex ridges, sheaths slightly campanulate, leaflets convex, grooved on the back, separated from each other by a narrow commissural groove; teeth herbaceous, lanceolate, acuminate, bordered with a narrow hyaline membrane which often joins two or three together; branches solid, in thick verticils, with 3-4 prominently winged angles. Central cavity $\frac{1}{5}$ — $\frac{1}{4}$ total diameter of stem. Fertile stems evanescent, 3-10 inches high, stout, of 2-8 internodes, the first of which are shorter than the sheaths, gradually increasing in length towards the top, flesh-colored, smooth, slightly angled, tissue filled with water, central cavity $\frac{1}{3}$ — $\frac{1}{2}$ total diameter; sheaths increasing in size toward the summit of the stem, brown above, inflated, with deep grooves and rounded angles, teeth large, lanceolate, pointed, grooved; peduncle usually elongated, with a distinct ring (rudimentary sheath) below spike; spike ovoid or lanceolate about 1 inch long, composed of 10-12 verticils, each containing an average of 9 or 10 clypeoles. Around the world in the northern hemisphere, from 38° to 83° north latitude; Canaries, Cape of Good Hope; best development between parallels of 40°-45°.

The stems vary greatly; in height from 3-15 inches, or in Europe, three feet; in form, from erect to decumbent or prostrate; in division simple, with erect verticils of branches, or divided into secondary stems which are themselves much branched. The branches start at the nodes just below the sheaths, one to each groove of the stem. In some forms they begin at the base, or are even augmented into secondary stems, especially in case of injury to the main axis; in other forms they branch only above the middle. Usually simple, they occasionally bear secondary branchlets, sometimes even disposed in more or less regular verticils (var. *pseudosylvaticum*). They are erect, decreasing in length towards the top, as do the internodes, forming a dense brush, especially in the sun in sand; or they are horizontal or recurved, as sometimes in the shade, or even secund, when the main stem is prostrate. The rhizome spreads horizontally under the earth, at the depth of about a foot. It is about two lines thick, solid, of a dull, dark brown color, slightly angled, thickly covered with cinnamon-colored root hairs, as are the tubercles, which in some forms are abundant. At intervals secondary rhizomes rise to the surface, but the tip of the primary one never

does so. During the summer one to six large oval buds are formed just below the surface, developing in spring into fertile stems, which appear in April and May, fruit, and then decay, while smaller buds offset below the surface and give rise to the sterile stems, which develop as the others are ready to disappear.

VARIATIONS.

This species offers no permanent varieties. Any so called variety placed under cultivation reverts to the normal form. Some varieties, as *campestre*, it is true, are found rarely save in circumscribed localities, but are not uniformly found there year after year. Soils, exposure, shade, moisture, heat and cold all have their influence in their production, and two or more forms may be found on the same rhizome. Heavy damp soils with bare areas, as in hoed crops, clayey banks of ditches, etc., will give the form *decumbens*; dry sandy soil in the sun, with little other vegetation, as railroad grades and dry fields, will give the typical, erect, branched, fastigiate or pyramidal forms. Wet meadows by streams, in rich soil among grasses, or borders of thickets, will give the variety *nemorosum*, while very wet undrained situations, as in some cranberry patches, will give the var. *riparium*. A late frost in spring, cutting down all the fertile spikes before fructification, seems to throw the surplus energy into the sterile stems, causing them to be modified and spike-bearing, giving the variety *campestre*; while a cold alpine or arctic climate appears to cause the varieties *arcticum* and *alpestre*. Other causes may produce the same effects, and probably very few of the governing causes are known.

TRICHOMANES PELTATUM IN JAPAN.

BY K. MIYAKE.

ABOUT two hundred and fifty species of ferns have hitherto been known from Japan. By the recent acquisition of the island of Formosa the number is increased, many species new to her or to science being constantly discovered. Among them *Trichomanes peltatum* is to be mentioned as one of the most interesting. According to Hooker's "Synopsis Filicum," (2nd edition), this peculiar little fern was only known to Samoa and New Caledonia, and it was found to grow in Formosa by Mr. Makino in his recent excursion to that island. It was in November of 1896 that Mr. Makino found the plant on a shaded rock on a hill in northern Formosa.

This fern was first described by the well known English pteridologist, Mr. Baker, after the specimen of Rev. Powell collected in Samoa island in July of 1864, and reported in the Journal of Linnean Society of London (Baker, *Journal of Linnean Society*, ix, p. 336, pl. 8, fig. 4).

The plant has a very small frond more or less orbicular in shape, about 2-3 cm. each way, and is attached without stalk to a very slender, wiry rhizome near its middle. The rhizome and the under surface of the frond are covered with fine black hairs. The fronds grow flat, closely adhering to the surface on which they grow, overlapping each other, so that the rhizomes are quite hidden.

When Mr. Makino found the plants covering a rock with their dark green colored fronds, he first took them for some frondose *Jungermannia*. It seems that the first discoverer of this plant found it on the bark of a tree, for Hooker writes as follows: "'The different branches of the candex,' writes the discoverer, 'run upwards, but so closely together that the margins of the fronds overlap each other. The fronds all lie flat upon the tree, so that the whole fern has much the appearance of a delicate foliaceous lichen or frondose *Jungermannia*.'"

The following description is quoted from Baker with little modification: Rhizome wiry, slender, wide-creeping, tomentose; fronds quite sessile, attached to the rhizome near the centre or towards the base, suborbicular in general outline, 1-3 cm. across each way, quite depressed to the surface on which they grow, and conspicuously overlapping one another, bright to darker green and delicately membranaceous in texture; the margin somewhat undulated, and sometimes rather deeply cleft in a direction from the circumference to the centre; the veins brownish and closely placed, one to several times dichotomous at a small angle, with numerous interrupted spurious veins between them at the margin and towards the centre; sori scattered, one to four in number; involucre cylindrical, firm in texture, more or less exserted, with a very much dilated slightly two-lipped mouth.

It seems that Mr. Makino's specimen is somewhat smaller than that of Mr. Baker's, and the former is dark green while fresh instead of being bright green as Mr. Baker described.

Botanical Institute, Imperial University, Tokyo, Japan, March, 1899.

HOW TO IDENTIFY THE SHIELD FERNS.

EVEN the beginner in the study of ferns finds it fairly easy to distinguish between the members of the smaller genera, like *Osmunda* and *Woodwardia*, but with genera such as *Asplenium* and *Dryopteris*, there are so many species that he is quite likely to become confused and wonder if it is possible to name them correctly at all. In Northeastern America, the genus *Asplenium* presents the fewer difficulties, for the species have no very striking superficial resemblances, but in *Dryopteris* the family likeness is stamped so distinctly upon all, that a few hints regarding their identification may not come amiss.

For the purposes of our study, the genus *Dryopteris* may be said to contain those ferns which bear upon the under side of the fronds round fruit dots covered with an indusium which is fixed to the frond by its depressed centre or by a sinus at one side. This difference in the way the indusium is fastened to the frond serves admirably to divide our species into two groups. The first, containing those species having an indusium fixed by the depressed centre has been placed in a separate genus (*Polystichum*) by English students, a proceeding which might well be followed in this country.

Taking *our* *Polystichums*, then, it is found that we have three species. The first is the well known Christmas fern (*D. acrostichoides*), common throughout the Northeastern States. It is evergreen, simply pinnate, and the upper part of the frond, which bears the fruit, is abruptly contracted. No other species is thus contracted at the summit.

The Holly fern (*D. lonchitis*) is plentiful in parts of British America, but does not stray into the United States in the east. Like the preceding, it is simply pinnate, but the fruiting portion is *not* contracted. This point distinguishes it.

The third species, *Dryopteris Braunii*, is a tall stately fern with at least twice-pinnate fronds, found in the deep cool shades of New York, New England and northward. It is the only eastern species with more than once-pinnate fronds, whose indusia are fixed by the depressed centre, and it may further be distinguished by its very chaffy rachis.

This brings us back to what we are pleased to consider the true *Dryopterids*. Of these, there is one species fairly common in damp rich woods throughout the Northeastern States, in which the pinnae as we proceed toward the rootstock are gradually

shortened until the lowest are tiny green ears. This is the New York fern (*D. Noveboracense*), and may always be distinguished by this characteristic. It is also faintly fragrant.

With the preceding species and also in drier woodlands and on rocks, occurs the Marginal Shield-fern (*D. marginalis*). Its fruit dots are worth a second glance, for they give this fern a sort of preëminence among its fellows. The dots, like little buttons, are arranged in precise rows, from one to five dots on the margin of each pinnule, and so close to the edge that they look as if they might almost project beyond it. There is no crowding here, such as many of the others present, but if a fruit-dot is absent its place is left vacant, and not usurped by the rest. This fern is common in most of the Eastern States. It is evergreen and twice pinnate. The position and arrangement of its fruit dots will settle the question of its identity.

The only species which might be confused with *marginalis* is Goldie's fern (*D. Goldieana*). There is no excuse for such a mistake, however, for while *Goldieana* may be called twice-pinnate, like the first, it is taller, much broader, lighter in color, thinner in texture, and has its fruit-dots in a double row on either side of, and close to, the midvein in each pinnule. The broad fronds and position of the sori are enough to distinguish this from the other species.

The Marsh fern (*D. Thelypteris*) is a lover of the wet, and is likely to be found in abundance on the borders of the nearest swamp or stream. The fronds come up singly from a creeping rootstock and are nearly twice-pinnate. They resemble closely the fronds of the New York fern except that they do not become shortened at the base as in that species. The edges of the fruiting pinnules, too, are inclined to roll backward, half covering the sori. These characteristics will separate it.

Much as these two resemble each other, there is a third species which seems to stand between them. This is *D. simulata*. It may be distinguished from the New York fern by the absence of the small pinnæ at base, and from the Marsh fern by its broader pinnæ and simple veins. In the Marsh fern, the veins normally fork once. This should be remembered when searching for *simulata*. Thus far it has been found only along the Atlantic seaboard from Maine to Maryland. It inhabits shady swamps, and when once known can not again be missed. At first glance it seems exactly like *Thelypteris*.

The fragrant Shield-fern (*D. fragrans*) is a rare little inhabitant of the exposed cliffs in northern New York, New England and Canada. Its strong fragrance "like sweet violets," and its habitat, always on the rocks, are enough to mark it.

In many situations with the Marsh fern may be found the Crest fern (*D. cristata*). Its sterile fronds are rather short and inclined to spread about, but the fertile stand erect. The latter are tall and narrow, the pinnæ tapering outward from broad bases. The pinnæ are cut into broad and deep lobes. The lowest pair of pinnæ are especially broad, almost triangular, and this may be considered a good distinguishing characteristic. The sori are above medium size, and quite conspicuous.

Dryopteris Boottii grows in wet woodlands, and to the ordinary observer seems too much like *cristata* to make its separation from the other worth while. It will be noted upon comparing the two, however, that the pinnæ of *Boottii* are cut entirely to the midrib, at least near their bases, and that the pinnules are themselves toothed and the teeth tipped with bristles. The fronds of *Boottii* are certain to be broader than those of *cristata*, and not so erect. The sori are also smaller and more crowded.

There now remains only the Spinulose Shield-fern (*D. spinulosa*) and its varieties. Of all the wood ferns, its fronds are the most numerously divided. They are often three times pinnate with narrow pinnules and bristle-tipped teeth. They are among the most common and graceful of our ferns and delight in the borders of shady swamps and the banks of woodland streams, where all who will may find them.—*W. N. C.*

A VARIETY OF DICKSONIA.

BY WILLIAM R. MAXON.

IN December last, Mr. F. G. Floyd, of West Roxbury, Mass., sent me a specimen of *Dennstædtia punctilobula* which he had collected in Massachusetts, in which the apex and the ends of the pinnæ were much crested. The general appearance of the frond is similar to the crested forms so often named in England, and seems to me to deserve a varietal name. So far as I have been able to discover, no variety of this strictly North American fern has ever been named. Our specimen may be characterized thus:

DENNSTÆDTIA PUNCTILOBULA CRISTATA n. var. Rootstock and stipe as in normal *punctilobula*; fronds one to two feet long, very

dark green, lanceolate or narrowly triangular, bipinnate, or towards the base tri-pinnatifid, many times forked at the apex, forming a tassel about one inch long; pinnae narrow-lanceolate, one to many times forked at the tip, tassel under half an inch long; pinnales oblong, toothed or divided nearly to the rachis; under surface and rachis markedly glandular-pilose; sori as in type. Type specimen No. 253,636 in the U. S. National Herbarium, which is one of a limited number distributed by Mr. Floyd as No. 199. Collected at Wildcat Notch, Blue Hill, Milton, Mass., Sept. 11, 1898.

Concerning the occurrence of this fern Mr. Floyd writes: "I found a large clump of them on the west slope of Blue Hill. It occupied a corner of a much larger patch of the same fern that was merely normal, and it attracted my notice immediately as I was wading through the main clump. There were dozens of the plants thus forked and I should say that they were spreading by means of their creeping rootstocks. A very noticeable feature was the unusual color of the crested form. They could be told from the normal plants at some distance by their darker green foliage." Years ago Mr. Davenport collected a crested form of *punctilobula* on the same slope of the same hill, and Mr. Floyd believes the two stations to be very close together. If this be true, *cristata* may be on a fair way to become a permanent addition to our flora. At present it must be regarded as an interesting variation apparently stable in a restricted locality, and bidding fair to spread successfully.

In the foregoing I have followed Lawson in his use of the generic name *Dennstædtia* in the "Fern Flora of Canada." The citation for the species should read *Dennstædtia punctilobula* (Michx.) Moore. *Dicksonia*, Prof. Underwood writes me, is to be applied wholly to the southern hemisphere tree ferns; and the genus *Sitolobium*, established by Desvaux upon our species as a type, can not be regarded as generically distinct from the tropical forms with creeping stems which come under the genus *Dennstædtia*, established by Bernhardt. It becomes necessary then to follow Moore and Lawson in adopting *Dennstædtia* as a generic name to replace *Dicksonia* as applied to our North American *D. punctilobula*.

Washington, D. C.

THE PTERIDOPHYTES OF GEORGIA.

BY ROLAND M. HARPER.

GEORGIA is not so rich in species of Pteridophytes as most regions are, but it contains some very interesting plants of this class, some of them not known to occur elsewhere. The State has a wonderful variety of soil and climate. The mountains of the Alleghany system, in the northwestern corner, in which the limestones and sandstones of the Palæozoic era abound, the lofty peaks of the Blue Ridge (some of them reaching an elevation of 5,000 ft.) in the northeastern part, belonging to the Archæan period, the shady woods and rocky hillsides of Middle Georgia, which is also Archæan, and the swamps and pine-barrens of South Georgia, which is mostly Tertiary, all have their characteristic species of ferns.

Asplenium, with eight or ten species, is the genus of ferns most largely represented. *Dryopteris acrostichoides* is the commonest fern in Middle Georgia, and *Pteris aquilina* the commonest in South Georgia. Two *Osmundas*, *O. regalis* and *O. cinnamomea*, are also very common in South Georgia, but less so in other parts. *Onoclea sensibilis* is not as common as it is farther north, but the reverse is true of *Woodwardia arcolata*, which resembles it considerably in its contracted fertile fronds and its foliaceous pinnatifid sterile ones, and is found in similar situations. *Woodwardia Virginica*, which occurs sparingly in the swamps of South Georgia, bears a striking resemblance to *Osmunda cinnamomea*, and is almost indistinguishable from that species at a little distance, even when growing with it, as it generally does.

Asplenium platyneuron is a common and graceful evergreen fern in the rocky woods of Middle Georgia. I have also found it once or twice in damp sandy places in South Georgia. *A. Filix-femina* is found in damp woods throughout the State. In dry rocky places in Middle Georgia is found *Cheilanthes lanosa*, a small dark-colored, woolly, evergreen fern. *Woodsia obtusa* is found in similar places, but both are rather rare in the State. Like most rock-loving ferns, *Woodsia* is evergreen, though one would hardly think so from the thin texture and pale green color of its fronds.

Two species of *Adiantum* are found, but they are rare. I know only one station in the State for each. *A. Capillus-Veneris* hangs its delicate fronds over the mouth of a cave in the lime-

sink region of Southwest Georgia, and *A. pedatum* is found in rich shady woods in Clarke county, Middle Georgia. Two *Polypodiums* also occur, both of them evergreen. I have found *P. vulgare* only in Clarke county, at the same place where I collected *Adiantum pedatum*, probably the extreme limit of the range of both in that direction. *P. polypodioides*, the only epiphyte fern in the State, is much commoner than *P. vulgare*. It is not always epiphytic however. In Middle Georgia it shows a decided preference for rocks, though further south, where rocks are scarce, it is always found on trees. In dry seasons the fronds of both species curl up as if dead, but in different manners. In *P. polypodioides* the edges of the pinnae turn in slightly, the frond becomes conduplicate, and the rachis curves inward. In *P. vulgare*, on the other hand, the frond becomes involute, and the rachis curves outward.

The Ophioglossaceæ are represented by three species. I have found *Botrychium Virginianum* and *B. ternatum* in rich woods in Clarke county, and the latter in Sumter county also. *Ophioglossum nudicaule*, a species of southern range, is also reported from this State. Only one Equisetum, *E. robustum*, has been reported, but further explorations will probably reveal others of this interesting family. There are two or three species of *Lycopodium* in Georgia, all growing in sandy bogs. *L. alopecuroides* is locally abundant in Sumter county, mostly in the pine-barrens. *L. Carolinianum*, which at first glance might be taken for a depauperate form of the other, grows also in Sumter county, but outside of the pine-barren region.

Selaginella apus, representing the Selaginellaceæ, a pale and inconspicuous little evergreen, fruiting in early summer, creeps along the ground, often forming dense mats, in wet woods and meadows in Clarke county. The interesting but little-known Isoetaceæ have two representatives in Georgia, both peculiar to the State. *Isoetes melanospora* is known only from Stone Mountain, 16 miles east of Atlanta, where it is said to grow in shallow depressions on the summit. This remarkable mountain is an isolated granite rock rising 600 feet above a comparatively level plateau of about 1100 feet elevation. There is no other mountain within 20 miles of it. Its base is about a square mile in area, and it is said to be the largest mass of solid granite in the world. It is almost bare of vegetation, and forms a very striking feature of the landscape of Middle Georgia. Besides this

Isoetes, there are several species and varieties of flowering plants on Stone Mountain which are rarely or never found elsewhere, as might be expected from its isolated position and peculiar formation. *Isoetes Engelmanni*, var. *Georgiana*, is reported only from Horseleg Creek, in the mountains of Floyd county, Northwest Georgia.

There are no doubt several more species of ferns in the State than have yet been discovered, for it has been comparatively little explored botanically. Few if any of the other Eastern States offer such an inviting field for botanical research.

Southbridge, Mass.

VEINING IN THE MARSH SHIELD FERN AND OTHERS.

IN distinguishing *Dryopteris simulata* from the Marsh shield fern (*D. Thelypteris*), one of the characteristics most relied upon is the veining of the fronds. In normal *simulata* the veins are simple and in *Thelypteris* they are forked. It may be well to note, however, that instances are not wanting in which these forms of veining are reversed. In his description of *simulata*, Mr. Davenport mentions a plant with a few of the lower veins once forked, and in Eaton's description of *Thelypteris* in "The Ferns of North America," he remarks, "very often the lower veins are thus forked and the upper ones are simple as in *Noveboracense*."

Miss Margaret Slosson, to whom we are indebted for calling our attention to the foregoing facts, writes: "I found some time ago a number of plants of *Thelypteris*, unusually fine ones, with practically all the veins of every fertile frond simple, though I detected here and there an occasional forked vein. The fronds appeared normal in other respects and I could not find a single simple vein in the sterile fronds growing plentifully from the same rootstocks. I have since seen these simple veins in other fertile *Thelypteris* fronds and fancy they are not uncommon." All of which seems additional proof of the close relationship of the two species.

In this connection it is interesting to note that in writing of *Thelypteris*, Eaton says, "*Thelypteris* is sometimes found with most of the veinlets simple and the lower pinnæ a little contracted." This sounds very much as if the writer may have seen the fronds of *simulata* and referred them to the other species which it resembles.—W. N. C.

FAIRY-RINGS FORMED BY LYCOPodium INUNDATUM.

WHILE visiting on the 20th of July, 1898, the sandy shores of Gilmore pond near Jaffrey, N. H., I was attracted by some exceptionally fine specimens of the dwarf club moss (*Lycopodium inundatum*). This species is reputed rather rare in America, but it has already been noted at a considerable number of stations, and where it occurs at all it is apt to be abundant. The striking feature of the specimens observed was that they grew in more or less definite rings, not unlike the so-called "fairy-rings" formed by various species of fungi. More than fifty of these rings were observed, together with various regular and irregular patches and segments of curves. The rings varied from 7dm to 4m. in diameter, the circumference being formed by a more or less regular band of prostrate vegetative shoots, which at the numerous forkings threw up abundant fertile stems.

Slight examination showed that the rings developed in a most natural way. A young plant, starting from a centre, sends out its prostrate forking stems in all directions, until soon a small patch of ground is pretty uniformly covered with the stems. These areas, although subject to irregularity from obstructions, are usually about circular. Several were observed which were from 2.5dm. to 4dm. in diameter. Now, it is a well known fact that the prostrate stems of *Lycopodium inundatum*, as they grow, constantly root near the tip, while the older parts begin to die and decompose. With this mode of growth and the early tendency of the stems to develop radially or centrifugally, the formation of the rings is at once explained. The older parts of the plant, which are at the centre, are the first to die away, and what is left is a ring of separate, diverging branches of what was once a single plant. These continue to grow as independent individuals. The size of the ring is thus an approximate indication of the age of any particular colony. The stems appear to grow from 2 to 3.5dm. in one season; a ring would, therefore, add nearly a foot to its radius each year, and its age be roughly found by halving its diameter expressed in feet.

It is not maintained that the rings are always so perfect as our theory would make them. There are several obvious sources of irregularity. The chief of these are the crowding of other plants, inequalities of the ground, and especially the fact that neighboring rings often become confluent and confused. However, making all due allowance for irregularities, the rings on the

shores of Gilmore pond were sufficiently clear to demonstrate that this annular mode of growth was not merely a theory, but a distinct tendency. One more circumstance of interest may be mentioned regarding the rings on Gilmore pond, and that is that they were never quite circular, but, when of regular growth at all, were always broadly elliptical. Furthermore, the ellipses were in nearly all cases so situated that their longest axes were parallel with the margin of the pond. The most natural inference is that the Lycopodium, in the manner of many other littoral plants, tends rather to develop *along* the shore in a region of tolerably uniform moisture, than toward or from the water which would bring it into wetter or drier ground.—*Abridged from an article by B. L. Robinson in Rhodora.*

THE SPORE-BEARING AREA OF FERTILE FRONDS.

THE *Woodwardia areolata* is not an uncommon fern in New Jersey. In form and texture the sterile leaves are particularly attractive, and the taller and deeper green fertile leaves late in the season are interesting, because of their strong contrast with their purely vegetable neighbors. It is interesting to note the observation of a leaf, during the last trip to the woods, in which some of the lower pinnæ were entirely sterile and approaching in width those of the ordinary form. The point that especially impressed me was the fact that the upper half showed the greater tendency to be fertile, while the lower approached nearer to the sterile form. This is in accordance with the general rule for the disposition of the sori upon fern leaves where there is no differentiation into the sterile and fertile sorts. With this thought in mind one does not need to look at the representatives of many genera before coming to the conclusion that the upper half of the frond is more generally devoted to spore production than the lower half. This is most strikingly shown in the Climbing fern (*Lygodium palmatum*), also in our vicinity, and the *Dryopteris Noveboracensis* growing in vast numbers along with the Woodwardia in question, shows the same thing in its fertile leaves and still more prominently the common Polypody of the shaded rockeries.

Just here there is another suggestion that this glance at the location of the fruitful pinnæ brings to mind. There is frequently, if not usually, a portion of the upper end of the fern leaf that approaches sterility. The uppermost and terminal pinnule of the

very ferns that have been named are not the ones to be selected for their abundance of sori. *Scolopendrium vulgare* may have all its sori in the upper half of the leaf, but none of them are close to the tip. There is a point in the fertile belt of pinnæ of the Christmas fern (*Dryopteris acrostichoides*) from which the reproductive tendency diminishes upward as well as downward, and this is true of the *Aspidiums* and their allies generally. This leads us up to the most striking illustration of the thought in mind, namely, Clayton's *Osmunda* (*Osmunda Claytoniana*), where as a rule the lower half of the upper half of each frond has its pinnæ fertile, while those above and below are vegetative in the full meaning of that term.

Returning now to our original "sport" of the *Woodwardia*, it is seen that the largest of the uppermost dozen pinnæ is at the summit; but not without sori, while, as before stated, the lowermost ones are sterile. It would seem that this freak would suggest that even in the normal fertile leaves of the *Woodwardia*, or any other fern for that matter, the reproductive activities are at their greatest in the upper middle of the spore-bearing belt of the leaf.—*Abridged from an article by B. D. Halsted in the Plant World.*

A NEW LOCALITY FOR *ASPLENIUM PINNATIFIDUM*.

ON the afternoon of March 26, 1899, a party of us had landed some two miles below Scott Run and had examined the cliffs and shore line for some distance toward that stream. Many dead fronds of *Onoclea Struthiopteris* were noticed, and also quite a number of *Camptosorus* and the more common species. While examining the face of the high, well-shaded portion of a cliff, I was surprised to discover in a narrow rift of the rock but a few feet in front of me, two plants of *Asplenium pinnatifidum* which had heretofore never been found in this vicinity. This most unexpected find stimulated the efforts of the party to such an extent that about ten minutes later Mr. W. R. Maxon, while scaling the more exposed portion of the cliff, discovered other plants, and a few minutes later every member of the party found as many of the plants as were desired and left many others. The specimens just found were large and deeply colored, owing to their shady, moist situation, while the others had paler and smaller fronds. The fronds of the former have short stipes

while those of the latter, owing to the deepness of the cracks in which they were growing, have long stipes and shorter fronds.

Though many cliffs have been examined no other plants of this fern have been found. The cause of its presence on this particular cliff is undoubtedly due to the presence of sufficient root moisture to counteract the drying powers of the wind. The crevices are long, narrow and vertical, thus differing from the generally horizontal fractures common on the other cliffs. Most of the plants were deep in the recesses of the narrow cracks where their roots especially were well protected. This slope exposure is sufficient to account not only for the presence of this fern, but of many others on these bluffs. Cutting off the trees would result in their utter extermination. Of the thirty-eight species of ferns now known from the vicinity of Washington, but four are not known to occur about these bluffs, the two Woodwardias, *Ophioglossum vulgatum*, and *Lygodium palmatum*.—Abridged from an article by William Palmer in *The Plant World*.

THE OSTRICH FERN IN VIRGINIA.

IT is more than a year since the discovery of *Onoclea Struthiopteris* by one of the Washington botanists, Mr. E. S. Steele, on an island in the Potomac about eight miles above the city. The addition of such an interesting fern to our District flora was naturally welcomed with enthusiasm, and a search for other stations revealed the plant growing in great abundance on the Virginia shore of the river, directly above the island referred to. I did not at that time realize what has recently been brought to my notice by Mr. W. R. Maxon, namely, that the discovery of the Ostrich fern in Virginia furnishes us with an actual extension of range for the species. I find no record of its collection at a point farther south than this, but it may be that other readers of THE FERN BULLETIN can contribute more exact information. Here it fruits rather shyly, although the sterile fronds attain a large size in the rich alluvial soil of the river bank.—*Charles Louis Pollard, Washington, D. C.*

[The Ostrich fern was for a long time supposed to find the southern limit of its range in Pennsylvania. In 1894 Mr. C. E. Waters found a colony of this species on the banks of the Gunpowder river, about twelve miles north of Baltimore, thus extending its range into Maryland. Mr. Pollard's note now sets the limit further south. Do any of our readers know of stations for the fern beyond this?—ED.].

EDITORIAL.

CYSTOPTERIS FRAGILIS

A long time ago, John Williamson wrote of *Cystopteris fragilis* as follows: "This is one of the earliest of our native ferns to welcome the coming spring. It is a fragile, delicate little plant, sending up its scroll-like fronds before the snow has scarcely left the ground." If this acute observer had asserted that this species is earliest of all to develop mature fronds, he still would have been within the bounds of truth. Observations made by readers of THE FERN BULLETIN during the past spring show this fern to be far ahead of any other. One enthusiastic fern-hunter in Connecticut sent us fronds eight inches high on the 19th of April, and wrote that in the same locality the trailing arbutus lacked nearly two weeks of flowering. If asked to name, off hand, the first fern to develop mature fronds, it is likely that few would have selected this frail species.

* *

The search for the first expanded frond discovered several interesting facts regarding the species which are earliest to fruit. It is commonly assumed that the cinnamon fern produces the first ripe spores, but this is a mistake, at least so far as it applies to the vicinity of New York. Here *Cystopteris* again bears off the palm. The cinnamon fern is not even a good second, for its relative, *Osmunda Claytoniana*, has shed many of its spores before the spikes of the other have assumed a cinnamon tinge. *Osmunda regalis* comes fourth on the list and it is a close race between the Christmas fern and *Botrychium Virginianum* for the next place, with the slight odds in favor of the former. After that, the procession passes into June with fruiting fronds so abundant that it is difficult to determine the succession further.

* *

COMMON NAMES

We are inclined to hold that a "common" name should be common somewhere, but this view of the case seems never to have been entertained by the present generation of nomenclature makers who vainly imagine that to give the plant the English equivalent of its scientific name is all that is necessary. But except in rare cases, common names originate in the fancies or from the observations of the common people, and thus follow no set rules. No

one can make a common name. In this connection we may refer to the attempt to fasten the name of evergreen wood fern upon *Dryopteris marginalis*. This species has long been known by the singularly appropriate name of marginal shield fern, and in a section where there are several other "wood ferns" that are evergreen, the movement to make this *the* evergreen wood fern seems to show more energy than judgment.

NOTES.

—We regret to announce that the first of our series of Biographies of Fern Students was not completed in time for this issue. The series will begin in the October number.

—Mrs. A. D. Moore, of Corning, N. Y., writes that on April 26 the Ostrich ferns in her garden had not started, but on May 29 they had reached a height of four feet and eleven inches, showing an average rate of growth of nearly two inches a day.

—We have had many complaints from subscribers recently, that THE FERN BULLETIN has not been received. This journal is issued promptly in the first week of January, April, July and October. Subscribers who do not receive their copies by the 15th, should notify us at once. We are glad to replace missing numbers, but cannot agree to do it unless notified within one month from the date of issue.

—The ferns which have been referred to *Aspidium juglandifolium* have recently received attention from Prof. L. M. Underwood, who decides, with apparently good reason, that what has been considered as one species is in reality eight. In the *Bulletin of the Torrey Botanical Club* for May, 1899, these species are segregated under the heading "American Ferns II. The genus *Phanerophlebia*." These ferns have usually been considered as *Aspidiums*, but it is apparent from the author's handling that he now believes them to be better placed in the genus *Phanerophlebia*, although he neglects to mention it. Three species are described as new and one variety is raised to specific rank. All are natives of Mexico or Central America except *P. auriculata*, which is found in the southwest. *Aspidium juglandifolium* may now be erased from our list of ferns of the United States, and this one placed in its stead.

—Mr. B. D. Gilbert, Clayville, N. Y., reports encouraging progress in his study of *Asplenium Filix-femina* and its varieties. Thus far he has received for study more than six hundred specimens of this fern, and has noted some twenty varieties not before reported from America. Every fern student who has or finds any peculiar forms of this species during the present season, should send them to Mr. Gilbert. He will be glad to name them and return them to their owner after study, or will give good exchange for them.

BOOK NEWS.

A special report of the Fern Chapter containing the papers presented at the meeting in Boston last August under the Chapter's auspices, has recently appeared.* The titles of the papers follow: "Abnormal forms and hybridity in ferns," "An interesting variety of *Osmunda Claytoniana*," "Notes on the ferns of the Ural and Caucasus mountains," "On the distribution of some Eastern American ferns," "On the genera of ferns; a study in the genus *Aspidieæ*," "Notes on a peculiar *Botrychium*," and a "Study of *Ophioglossum*." Those who were unable to be present at the Boston meeting will welcome this opportunity to secure the papers in convenient form for study. The authors of the papers are all prominent fern students, which make these notes worth preserving. The publication of special reports is a new departure for the Fern Chapter, but one that we hope to see continued. Several members are now at work on important problems in fern study, and the Chapter can find a new field of usefulness in the publication of the results of these studies.

Since it became known that Mrs. Parsons was preparing a work on the ferns, lovers of these plants have impatiently awaited the completion of the volume, which they hoped would be more easily understood than the average text book. In "How to Know the Ferns"† they are not likely to be disappointed. In scope the book is modelled closely after the author's volume, "How to Know the Wild Flowers," and is well illustrated, containing seventy seven illustrations, forty seven of which are full page plates. Among the chapters may be mentioned "Ferns as a

*Papers presented at the Boston meeting under the auspices of the Linnæan Fern Chapter, August 24, 1898. Binghamton, N. Y.; Willard N. Clute & Co. 12-mo., 32 pp., price 25 cents.

†"How to Know the Ferns," by Frances Theodora Parsons, New York; Charles Scribner's Sons, 1899. 12-mo., 212 pp., price \$1.50.

Hobby," "When and Where to Find Ferns," and "Fertilization, Development and Fructification of Ferns." The greater part of the book is devoted to histories of our Eastern ferns. Following the scientific description of each species is found matter of a more popular nature, which will be welcomed by those who wish to know the ferns as living things. One defect in the book seems to be the absence of a key by which one may quickly trace a specimen to its proper place. Ferns differ less from one another than do flowering plants, and such differences as exist are principally in the shape of the leaf with no characteristics of flower or fruit, in the usual sense, to help one out. The key given seems inadequate, grouping as it does, eleven species under one heading and thirteen under another, in the latter case, perhaps obliging the young student to compare his plant with twelve descriptions before coming to the right one. A supplementary key on scientific lines would have been very acceptable. The illustrations, however, assist materially in the identification. With a few exceptions, these are the best we have seen in any fern book. The artists have caught not only the form of the frond, but the habit and habitat as well. The book occupies a unique place in American fern literature, and will prove an attractive and efficient help toward a knowledge of our native ferns.

Six species of grass have provided Prof. Sargent with the material for a pleasing little volume, which has just been issued, under the title of "Corn Plants."[†] The six species treated are: "Wheat, the king of cereals," "Oats, the grain of hardiness," "Barley, the brewer's grain," "Rice, the corn of the East," and "Maize, the corn of the West." Much thought and originality are manifested in the treatment of the subject. After some account of the ancient festivals in honor of "corn," as these plants are collectively called, we are told how they manage against wind, weight, wet and drought; how they grow, flower and produce seed, with such an abundance of information on all these points as to cause us to have a greater interest in these plants in future. The economic aspects of the corn plants are also touched upon, but without the usual dry statistics; in fact there is not a dull page in the book. Thirty two illustrations, mostly by the author, help to explain obscure points.

[†]"Corn Plants; their Uses and Ways of Life," by Frederick Leroy Sargent, Boston & New York; Houghton, Mifflin & Co., 1899. 12-mo., 106 pp., price 75 cents.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—*Adiantum pedatum* is the species for special study. Make up your notes and send them in.—E.

—Specimens of *Selaginella cinerascens*, described in the April FERN BULLETIN, are offered to members of the Chapter for ten cents, by Miss Laura F. Kimball, National City, California.—C.

—One important change in the Constitution is the dropping of the associate class and the substituting of unlimited active membership. It is hoped that all present associates will renew as actives.—E.

—Through misapprehension of the method of notification of arrearage, several members failed to get the April BULLETIN. If they will kindly remit to the treasurer, he will see that they receive it at once. We shall soon adopt a more direct method of notification.—E.

—Some vexatious, though unavoidable delays in the revision of the Constitution, which is to be published in the annual report, has delayed the latter document. It will be issued as soon as possible, and in the meantime, any member who has recently changed his address, or has a new member to propose, should notify the treasurer at once.—C.

—The demand for the pamphlet containing the papers read at the Boston meeting, shows that fern students are aware of its value. Members of the Chapter who need extra copies should order before the supply is exhausted. The price is 25 cents. Members who have not had one copy may have the first one upon payment of 15 cents. Orders should be addressed to James A. Graves, treasurer, Susquehanna, Pa.—C.

—To judge from appreciative words and promises of assistance, the Chapter herbarium will prove popular and successful. We want every one to help, and would like a complete representation of the Pteridophyta of every locality. We hope especial pains will be taken to get all forms of *Asplenium Filix-famina*, *Dryopteris cristata* and its relatives, as well as other variable species.—E.

—Mr. W. W. Eggleston reports a forking frond of *Woodsia alpina* from Mt. Willoughby, Vermont.

THE BRYOLOGIST,

A DEPARTMENT OF THE FERN BULLETIN,
DEVOTED TO THE STUDY OF NORTH AMERICAN MOSSES.
ISSUED QUARTERLY.

EDITED BY DR. A. J. GROUT, PLYMOUTH, N. H.,
To whom all correspondence regarding the mosses should be addressed.

This department is issued separately at twenty-five cents a year. Subscriptions should be addressed to the Fern Bulletin, Binghamton, N. Y.

VOL. II.

JULY, 1899.

No. 3.

A BRYOLOGICAL MEMORIAL MEETING AT COLUMBUS, OHIO.

COLUMBUS was the home for many years of William S. Sulivant and Leo Lesquereux, two names which will always awaken love and reverence from all students of North American mosses and hepatics. It is twenty-six years since Sulivant died, and this last quarter of the century has seen a marked extension of the limits of bryological study and a large increase in the number of students. It seems a fitting time and place to take a survey of the field, review the past and make plans for the future, hence it is proposed to make the coming meeting of the American Association for the Advancement of Science, which is to be held at Columbus, the occasion for a Memorial Day in honor of the nestors of American bryology and to call on all botanists and botanical magazines to help make the occasion a memorable success. It is proposed to present a series of papers illustrated by photographs, specimens and microscopical slides, as well as books and pamphlets, under the following topics: Historical papers and collections showing the bryological work of Hedwig, Palisot de Beauvois, Michaux, Muhlenberg, Bridel, Torrey, Drummond, Hooker and Wilson, Greville, Sullivant and Lesquereux, James and Watson, Austin, Ravenel, Wolle, Eaton and Faxon, Müller and Gottsche.

Supplementing these there will be shown collections of specimens, macroscopic and microscopic, illustrating the monographic work of living American students. If foreign students who have worked on North American Bryophytes can be persuaded to cooperate with us, the following will be asked to contribute: Bes-

cherelle, Brotherus, Cardot, Dixon, Kindberg, Mitten, Pearson, Röhl, Stephani, and Warnstorf.

An effort will be made to secure the loan of type specimens and illustrations from the following sources: Academy of Natural Sciences of Philadelphia, Academy of Sciences of New York, Columbia University, Harvard University, The National Museum, Ohio State University, The University of Wisconsin, and Yale University, as well as from private collections. It is also intended to exhibit any portraits, autograph letters and type specimens and drawings of special interest which may be loaned for the occasion, as well as presentation copies of books and pamphlets.

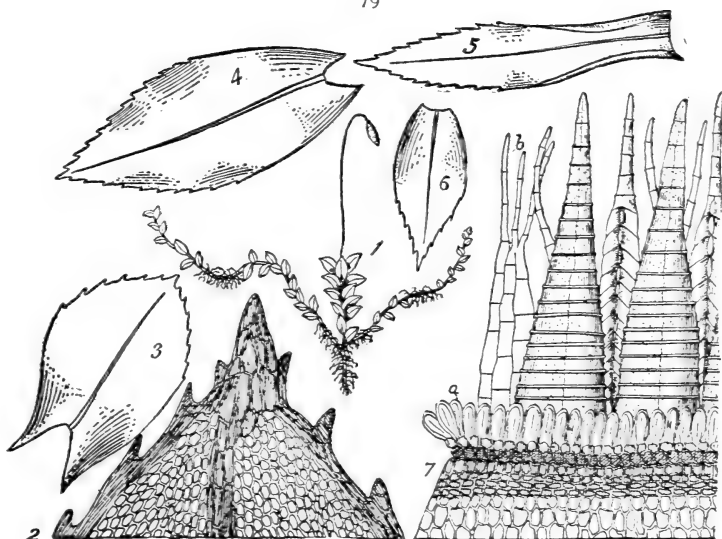
The following committee of organization will gladly answer any questions and give assistance to those wishing to contribute: Mrs. N. L. Britton, New York Botanical Gardens; Prof. W. A. Kellerman, Ohio State University; Prof. L. M. Underwood, Columbia University; Prof. Charles R. Barnes, University of Chicago; Dr. George G. Kennedy, Readville, Mass.—*E. G. B.*

THE MNIMUMS.

THE Mnumms are present everywhere in moist, shady places, and their large size, broad leaves and conspicuous capsules render them objects of interest to every one who is at all observant of nature.

One of the first signs of vegetable life that appears after the snow is gone is the array of upright green "lances" of the "Woodsy Mnumm (*M. sylvaticum* Lindb), generally known as *M. cuspidatum* Hedw. These green lances are young sporophytes or "fruits," and rapidly develop the mature pendent capsules shown in the figure, which will help our readers to identify it without very much description. The Woodsy Mnumm is common in all the Eastern States in lawns, at base of trees, and on decaying logs. It is very abundant in shady, moist soil in the lawns of the parks of Greater New York.

Its capsules mature in May, but our readers will find them in good shape for study at the time this issue of the *BRYOLOGIST* is received. Some members of the Sullivant Chapter have already sent us specimens of this moss, with its "lances turned at the point," for identification, and there is not a single member but can readily collect and determine this common but interesting species.



MNIUM SYLVATICUM Lindb.

1, Plant natural size showing stolons; 2, apex of leaf enlarged to show the serrate margin and cuspidate apex; 3, 4, 5 and 6, various shapes of leaves; 7, mouth of capsule enlarged, showing annulus (a) and peristome, including cilia of internal peristome (b). (From Mrs. Britton's *Observer* articles, by permission).

There are as many species of *Mnium* in our ranges as of *Dicranum*, but the leaves are so large and usually so well characterized by border or teeth that they can readily be determined without the capsules.

In determining *Mniums* the leaves should be first examined under the compound microscope to determine whether or not they have the borders of long narrow cells, illustrated in figure 2 and in the glossary which appears in this issue. If the border be present, is it entire, serrate with a single row of teeth, or with a double row of teeth, *i. e.*, with the teeth in pairs? If the margin be present and the teeth be single and single-celled, and not present much below the middle of the leaf, and also if the capsules be single and the stolons present, you have the Woodsy *Mnium*.

If the plant was gathered on rocks or stones by the bed of a brook and has very large stolons with large leaves, it may very likely be the "toothed *Mnium*" (*M. cuspidatum* (L) Neck.), usually known as *M. affine* Bland. This species is distinguished

from the Woodsy Mnium by the very long slender teeth on the margins of the leaf. These teeth are two or three cells in length and extend to the *base* of the leaf. So marked is the length and distribution of these teeth that a hand lens alone suffices to distinguish the species when once one knows them. The cells of the leaves are also much larger than in the Woodsy Mnium.

The "beaked Mnium" (*M. rostratum* Schrad.) closely resembles the above species and is quite frequent, but the leaves are obtuse and mucronate instead of acuminate, and the operculum, if present, clearly marks the species by its long beak. Often growing with these species, but larger, without stolons and with two or three capsules in a cluster, is "Drummond's Mnium" (*M. Drummondii* Br. & Sch.). Another species sure to be met with in wet and swampy places is *Mnium punctatum*. Its leaves are so large that it could be easily mistaken for a flowering plant. It matures its capsules sparingly and earliest of all our species, in early or late April according to the locality and season. The operculum is long-beaked, the leaves are obovate, bordered and entire, and very broad and obtuse at the apex, slightly emarginate, with usually a slight apiculus and the costa nearly or quite reaching the apex. A form in which the costa ceases some distance below the apex is variety *elatum*. The cells of the leaves are so large as to be readily seen with a hand lens. Species of *Bryum* are likely to be mistaken for Mnium, but in Mnium the cells are little, if any, longer than broad, while in *Bryum* they are usually much longer than broad. In our next issue we hope to give a key to all our eastern species with their distribution.—
A. J. G.

NOTEWORTHY AMERICAN MOSSES.

IN THE number of the *Minnesota Botanical Studies*, published in May, 1897, Mr. J. M. Holzinger has some very valuable notes on "The Genus *Coscinodon*." He gives the following distinctions for separating the troublesome species *C. Wrightii* and *C. Rauli*.

C. Wrightii is silvery-green from the presence of the much lengthened hair-points on the upper leaves, which stand erect. It grows in small, dense cushions of a lighter color than *C. Rauli*. The hair points while diminishing in length toward the base of the stem, are still distinctly present and in the middle of young

stems the hair-points are as long as the leaves. Leaves *erect-appressed*, the blades distinctly spoon-shaped all along the stem. In section the leaves are uniformly and evenly concave, the costa projecting evenly above and below the lamina except at apex where it projects on the under side alone; costa with a single row of large cells across the *upper surface*, continuous with the leaf cells.

C. Raii is less silvery, there being fewer long hairs and is usually in looser, more extended patches; coarser and more branching; the hair-points discontinue below the upper third of the stem in young plants; stem leaves *obliquely ascending*, spreading with a distinct keel on the under side. In section the costa is *deeply furrowed* above.

It is stated that *C. Renouldi* Cardot is not sufficiently distinct from *C. Raii* on the authority of Cardot himself.

Mr. Holzinger also publishes *C. Wrightii*, var. *brevis*, Holzinger. "Monœcious; simple or branching, one of the branches usually terminating in the antheridial, the other in in the archeogonial bud; leaves crowded toward the top of the stem into a terminal bud, rapidly reduced to scales so that the stem below the middle is nearly naked; leaves not distinctly spoon shaped." Winona, Minn., *Holzinger*.

In the issue of the same publication for June 15, 1898, M. Jules Cardot publishes *Fontinalis Holzingeri*. "Of the group Heterophyllæ related to *F. Missouriica* Card, but with leaves more rigid, cells longer, not or scarcely flexuose, strongly chlorophyllose, marginal firm." Northeastern Minn., *Holzinger*.

In the same paper Mr. Holzinger shows conclusively that *Homalia Jamesii*, Schimp, is at most only a variety of *H. trichomanoides* (Schreb.) Br. & Sch., the only difference being in the more obtuse leaves of the American form, which character even is quite variable.

H. Macounii Kindb., is also given as a synonym of the variety *Jamesii*.

MOSSES FOR DISTRIBUTION TO THE CHAPTER.

By A. J. Grout. *Mnium sylvaticum*, *M. cuspidatum*, *M. punctatum* st., and *M. rostratum* st. for 10 cents. By Miss Cora H. Clarke, 91 Mt. Vernon street, Boston, Mass., any or all of the following species for a self-addressed stamped envelope: *Pottia truncatula*, *Gerorgia pellucida*, *Pogonatum tenue*, *Anomodon rostratus*.

AN ILLUSTRATED GLOSSARY OF BRYOLOGICAL TERMS.

BY A. J. GROUT, Ph. D.

THIS is not intended to be an exhaustive glossary of botanical terms, but a glossary of those terms which are either confined to bryological works or are used in a somewhat different meaning when applied to mosses. Thus the common terms descriptive of leaves are omitted, except acumen and a few others that are used in a peculiar or unusual way by some authors. Very few terms are here defined that are sufficiently well defined in the common phanerogamic botanies like Gray, Wood, or Britton and Brown.

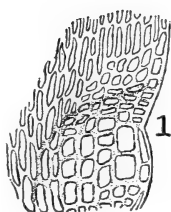
Braithwaite's British Moss Flora, Lesquereux and James' Manual, and Dixon and Jameson's Handbook of British Mosses have been largely consulted and an attempt has been made to determine the meaning of each term according to the usage of all the authors accessible.

For most of the cuts we are indebted to the kindness of Mr. H. N. Dixon, Mr. Jameson, and their publishers, who have very kindly allowed us the use of the cuts in their Handbook of British Mosses, a work which should be in the hands of every moss student whether English or American. Terms whose meaning can be made sufficiently clear by definition are not illustrated as a rule. In order to use the same figure to illustrate two or more definitions without having definition and figure too far apart, the glossary will be arranged alphabetically under topics, such as leaves, capsules, etc. The first section will consist of those terms which apply to leaves.

TERMS USED IN DESCRIBING LEAVES.

Acumen, the gradually tapering narrow point of an acuminate leaf. (Fig. 2, *b*).

Acuminate, a term usually applied to leaves that gradually taper to a narrow point. A few recent writers use term as applying only to those leaves that are not uniformly narrowed and limit the term acumen to that part of the apex beyond the point where the narrowing begins to be less abrupt. According to these authors a leaf uniformly narrowed would not be acuminate, no matter how slender the apex. The author has followed this usage to some extent in previous writings, but general usage does not seem to sanction this restriction of the term.



Acumination, see acumen and acuminate.

Alar cells, the cells at the basal angles of the leaf, commonly different from the cells of the main part of the leaf, being shorter and often nearly square, or inflated and hyaline, and often highly colored. (Fig. 1).

Apical cells, the cells composing the apex of the leaf. They are often broader and shorter

than the cells of the middle of the leaf.

Areolation, the net-work formed by the outlines of the cells of a leaf.



Auricles, small lobes at the basal angles of the leaf, usually consisting of cells differing from those of the main part of the leaf in size or shape or both. (Fig. 1 and Fig. 2. *a*). Properly used only when there is an outward curve in the outline of the leaf at the base, as in the figures, but often used loosely to denote the basal angles of widely decurrent leaves.

Basal or basilar cells, cells at the base or insertion of the leaf, often of different shape and color from those of the main part of the leaf.

Bicostate, having a double costa, which is usually much shorter than in leaves having a single costa.

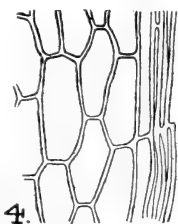


Bifarious, growing in two ranks.

Bracts, a term applied to the leaves surrounding the reproductive organs. Those surrounding the antheridia are called perigonial bracts or leaves, and those surrounding the archegonia and base of seta are called perichæatial.

Bistratose, of two layers of cells. (Fig. 3).

Canaliculate, channelled. Applied to leaves with margins incurved, so as to give them a channel-like form, *e. g.* the upper part of the leaves of *Dicranum fuscescens*. A more complete inrolling until the margins meet would make the leaf tubulose.



Bordered, having a margin different from the rest of the leaf. In *Mnium* and *Bryum* the border consists of a few rows of greatly elongated cells, often in two or more layers. In *Fissidens* the border is of a different color, but with little difference in cell structure. (Fig. 4.)

(To be continued.)

NEW AMERICAN MOSSES.

From Memoirs of the Torrey Botanical Club, 6 : No. 2.

BRACHYTHECIUM POPULEUM OVATUM n. var. Often having the appearance of var. *rufescens*, but with the stem leaves broadly cordate-ovate 1.4 by 0.8 mm., concave, margins reflexed below, rather abruptly narrowed to a much shorter subulate acumination; costa very stout, often ending below apex; branch leaves ovate-lanceolate, median cells 5 : 1. On dry rocks in woods with *Grimmia apocarpa*. Johnson and Peacham, Vt.; Indian Falls, Owen Sound; New Harbor, Newfoundland, Jan. 30, 1881.

BRACHYTHECIUM LEIBERGII. Branch leaves falcate-secund, decurrent, 1.2×0.4 mm., lanceolate, gradually very slenderly acuminate, serrate, costate to beyond the middle; median cells fusiform, 8-10 : 1; basal shorter and broader; quadrate alar cells numerous; stem-leaves ovate to ovate lanceolate, more strongly plicate; monoicous. Seta red-brown, roughened with rather low blunt papillae; capsule light brown, 1.5 mm., long, 1.5-2 : 1, short-ovoid, unsymmetric, horizontal; operculum short conic; annulus present; cilia two or three, appendiculate. Type locality, summit of "Bareknob," Traill River Basin, Idaho, alt. 5,500 feet. (J. B. Leiberg, 288. July, 1891). The gametophyte closely resembles *B. erythrorrhizon*, from which it differs in the rough seta and in being monoicous. Easily distinguished from *B. velutinum* by the larger stem leaves.

DICRANUM LONGIFOLIUM SUBALPINUM, Milde. "Densely tufted and reminding one strongly of *Campylopus Schwartzii*, blackish green, leaves erect-spreading, stiff, shorter than in the species, mostly broken off, much less strongly dentate." *Limpicht, Lauhmoose*. On exposed rocks of "the nose" Mt. Mansfield summit. July '96, A. J. Grout. Determined by Prof. R. H. True, who remarks that it is sparingly collected in Europe.

From a revision of the North American Eurhynchia, by A. J. Grout. Bull. Torr. Bot. Club, 25 : 221-256. 1898.

EURHYNCHIUM STRIGOSUM ROBUSTUM, Roell, Hedwigia, 36 : 52. 1897. *Eurhynchium strigosum* (in part) of American authors. Gametophyte with the habit *Brachythecium plumosum*, branches 6-12 mm., long, ascending or erect, often fasciculately divided, terete-foliate, more blunt than in *E. strigosum*; leaves from the middle of the branches erect spreading, ovate-lanceolate, very slightly or not at all decurrent, $1-1.3 \times 0.4-0.5$ mm., usually acute; quadrate and oval alar cells confined to the extreme angles; stem leaves $1.2-1.5 \times 0.4-0.6$ mm., longer acuminate, acumination often subfiliform. Sporophyte rather larger than in the typical form. Type locality, vicinity of Chicago, Ill.; Eastern Canada and in the United States from Louisiana to Minnesota and eastward. More abundant northward. The common eastern form.

—Mr. B. D. Gilbert has a specimen of *Dicranum spurium*, collected by E. C. Howe, at New Baltimore, N. Y.

80 cts. per Year
15 cts. per Copy.

Vol. VII.

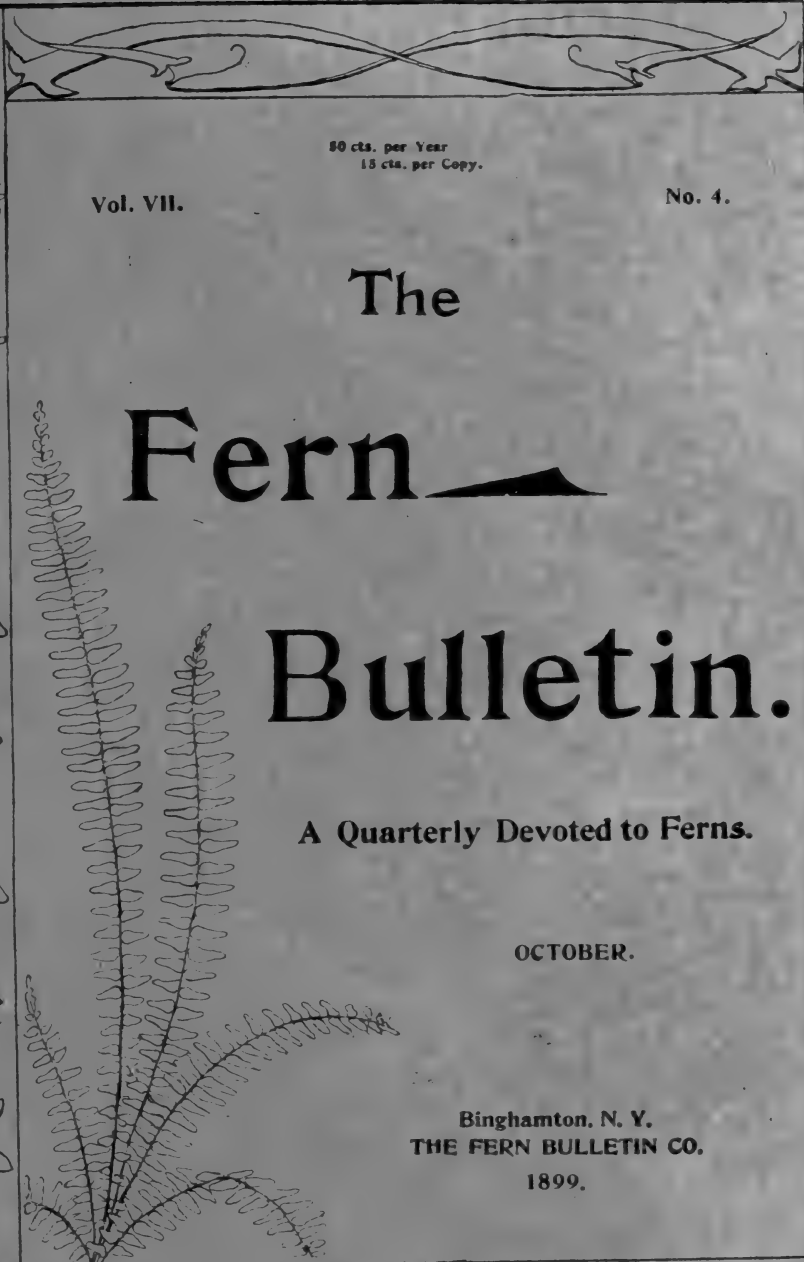
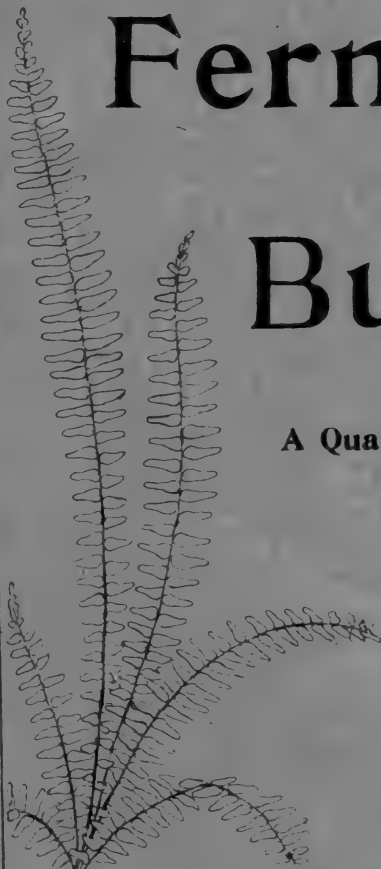
No. 4.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

OCTOBER.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1899.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

Articles pertaining to any phase of Fern life solicited.

Communications intended for the editor should be addressed to Willard N. Clute, New York Botanical Garden, Bronx Park, New York City.

If this paragraph is marked, your subscription expires with this number. The journal is not sent beyond the time paid for. An early renewal will keep your files complete. We have no back numbers earlier than Vol. VI.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter

THE LINNAEAN FERN CHAPTER.

PRESIDENT, A. A. EATON, SEABROOK, N. H.

Secretary, W. R. MAXON, U. S. National Museum, Washington, D. C.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

WANTS AND EXCHANGES.

Special announcements inserted here, for One Cent a word. No notice received for less than 25c. No charge for address. Mail all notices to the Binghamton, N. Y., office.

WANTED—*Linnaean Fern Bulletin*, Nos. 2, 3, 4, 5, and *Fern Bulletin* Vol. V, No. 3. Address, T. J. Fitzpatrick, Lamoni, Iowa.

FOR SALE—"Ferns of Iowa and their Allies," a 14-page descriptive pamphlet of interest to fern lovers. Only a few copies left. Price 10 cents. Address, T. J. Fitzpatrick, Lamoni, Iowa.

WANTED—LINNAEAN FERN BULLETIN, Nos. 2, 7, 11 and 12 of Vol. I-III; Nos. 1 and 3 of Vol. IV, and FERN BULLETIN Vol. V. Miss C. Harriot, care Mrs. Isaac Spurr, Mt. Washington, Berkshire Co., Mass.

WANTED—LINNAEAN FERN BULLETIN, Nos. 2, 7, 11 and 12, of Vol. I-III; Nos. 1 and 3 of Vol. IV, and FERN BULLETIN Vol. V. S. M. Newman, Washington, D. C.

WANTED—To exchange sets of from 20 to 30 specimens of Eastern New York ferns, containing among others *Schizaea*, *Lygodium* and *Scolopendrium*, for an equal number from the Central, Southern or Western States. The Fern Bulletin, Binghamton, N. Y.

FOR EXCHANGE—Nos. 18, 21, 61 and 62, and *Selaginella Bigelovii*, for 20 and 89. Laura F. Limball, National City, Calif.

WANTED—Nos. 7, 12, 29, 30, 40, 49, 58, 59, 100, 126, 178, 100. *R. ternatum intermedium*. For Exchange, Nos. 51, 88, 165. *Oxalis Pricea*, *Ophioglossum Engelmanni*. Miss Sadie F. Price, Bowling Green, Ky.

THE FERN BULLETIN

VOL. VII.

OCTOBER, 1899.

No. 4.

THE GENUS *EQUISETUM* WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON

FOURTH PAPER.

VARIETIES OF *EQUISETUM ARVENSE* L.

1. *Irriguum* Milde. Scape ascending or erect, 3-12 in. tall, brownish above, pale green below, 10-12 angled, with usually dependent spike. Branches verticillate below, or often for two-thirds the length of the scape, simple or branched, sterile, or bearing small, often proliferous spikelets. Stem with stomata and chlorophyl. This in early spring is like the ordinary fertile form, but close inspection shows that it is green on the joints below, and at time of fruiting small buds are protruding in the grooves. These develop into branches as the fruit spike decays, withers and recurves. As the season advances the branches usually bear branchlets, the dead portion above becomes detached, and the rest persists, appearing like any ordinary sterile stem. This form is analogous to the fertile stem of *E. silvaticum*, at first without stomata or chlorophyl, but later developing them, but it is never found as a distinct race. It is, however, common in some localities, especially where the plant is extra vigorous, usually in a moist, sandy place, or even in shallow water, where Milde first discovered it. The spikes are at the best about May 15th, though its branches are not developed till June 1st, when the spike is dried up. It differs from the variety *campestre* in being at first normal, while the latter develops spike and branches together.

2. *Nemorosum* A. Br. Stem erect, 1-3 ft. high, pale green, nearly white or pinkish, 12-16 angled, naked below for one-third its height, and smooth. Branches horizontal or slightly ascending, 5-8 inches long, 3-4 angled, with an occasional secondary branch. This is the well-developed form, found usually in open woods, in moist, rich earth, or by fences, under bushes, but occasionally in meadows by water courses. Milde says the branches

are four-angled, but in America they are as often three-angled. It is the variety *triangulare* of Waters, although many other forms bear triangular branches. There appears to be no clear line of demarcation between the large woods form and the low meadow form (*boreale* Bong.), which usually has but a 5-8 angled stem. The size and absence of branches below are evidently caused by a very cool, rich, moist soil and no competition, and in a measure by shade. In proportion as it grows in the sun and drier soil the branches become shorter and more ascending, the internodes less developed, especially below, bringing the branches nearer the ground, and giving a general brush-like appearance.

3. *Pseudo-silvaticum* Milde. Stem erect, $1\frac{1}{2}$ -2 ft. tall, green, 12-angled, naked below. Branches horizontal, 6 inches long or so, 5-angled, solid, with more or less regular verticils of branchlets in the lower part, these often again bearing branches. In shade, among trees, bushes, or by walls, in rich earth, connected by a more or less complete series with variety *decumbens*. Though apparently rare in its well-developed form, it is probably present in some of its stages wherever the type is found. It has been sent me from British Columbia.

4. *Boreale* Bong. Sterile stem simply branched, with smooth, triangular, ascending or erect branches. Teeth of sheaths acute, black. This is evidently nothing but the meadow form of *nemorosum*, the branches erect from growing in sun. Milde says Lyall collected it in British Columbia. It is apparently the most common form three, as I have received beautiful specimens from several localities, collected by A. J. Hill and J. K. Henry. I also have it from Berkeley, Calif., collected by Blasdale.

5. *Decumbens* Meyer. Stems prostrate, densely branched at base, or even for one or two internodes below the surface. Branches often overtopping the main axis. Of this variety there are two forms. The main axis is present in the first, bearing 6-8 angled branches below, which often exceed the stem. In the second form there is no primary axis, but a multitude of secondary stems arise direct from the rhizome and, thickly subdividing, form a bush. They are both found in cultivated fields; the former in damp, sandy localities, the latter in drier, sandy or loamy situations, on railroad embankments, by roadsides, etc. The cause of the first is not evident. A cold, wet, sterile soil which has recently been stirred seems to produce it, especially late in the season, in August or September,

after hoeing is done. It is necessary that they be scattered and not choked by weeds. The branches are always diffuse, slender and procumbent. The other form is often produced by injury to the main axis, especially by late frosts in spring killing the sprouting stem, which then puts out branches at the extremity of the living portion.

6. *Alpestre* Wahl. Stem procumbent with point ascending; 6-9 angled, 4-9 inches long, with internodes shortened, often curved. Branches secund, nearly fastigiate, somewhat stiff, 3-5 angled. This grows usually in hard gravelly soil, where it is inundated much of the year. I have also found it in a bog with *Eriophorum gracile*, where there was no safe footing. It appears to be the result of an excess of water, as the normal form will be found on the nearest dry land. It rarely fruits, but when it does so, is belated and on stems intermediate between sterile and fertile. It is then similar to the varieties *arcticum* or *campestre*.

7. *Arcticum* Ruprecht. Fertile stem erect, $2\frac{1}{2}$ -4 inches high or more, 4-6 angled, green, firm, often like a sterile stem below, pinkish and soft above, usually bearing a few simple, scattered, 3-4 angled branches, which often overtop it. Teeth grooved on back. Sterile stem procumbent, ascending or erect, pyramidal branched. I have seen this only in a cranberry bog formed at the bottom of a gravel pit, where it is wet throughout the year; fruiting August 1st. Very much like the next in appearance, especially when dry.

8. *Campestre* Schultz. Fertile stem stout, green, grooved, 3-12 inches high, 7-12 angled, bearing more or less regular verticils of branchlets, and terminated by a spike which rarely disseminates spores. Appearing in two forms: *a. Macrostachya*—Stem firm, stout; bearing scattered branches below, becoming more fleshy and pink in upper internodes. A metamorphosed fertile stem. *b. Microstachya*—Similar in all respects to an ordinary sterile stem, but the main axis terminating in a minute spike of 3-4 whorls. In both of these forms we find every gradation from stem to spike; the lower part of the spike often being normal and the top proliferous. Again, some of the verticils show sporocarps, sheaths and teeth intermixed; and we may find all degrees of variation to show that the ring about the shaft is a modified sheath, and the sporocarps modified teeth. This variety is often caused by luxuriance. Whenever a late frost cuts down the fruit stems, the energy reserved for fruiting is thrown into

buds that normally would be sterile, and a partial metamorphosis results. In some years and localities the number of specimens is very great; again, some localities are prone to produce it, a few being found every year. A clay loam seems to favor it, but it is often found spontaneous with no apparent cause.

9. *Polystachyon*. Ordinary sterile stems with tips of branches ending in spikelets. Rare. I have found but few of these. They may bear from 2-15 spikelets. The branches are very short, and all I have seen are small, about three inches tall; with the variety *campestre*.

MONSTROSITIES.

These often occur, mostly in the fertile stem. Many of them, such as proliferous points, branches in the middle of the spike, etc., have been noticed in the foregoing remarks. I have seen two others that deserve notice. One is a normal fertile stem with two spikes, one above the other on a short internode. The other is also a fertile stem, divided to near the middle and bearing a spike on each part.

[Mr. Eaton has prepared sets of eight of the varieties here treated, which will be distributed only to members of the Fern Chapter and subscribers and exchanges of THE FERN BULLETIN upon receipt of forty cents to pay for postage and packing. The sets will not be divided. In subsequent numbers all the other species in North America will be similarly treated. Address all communications to Alvah A. Eaton, Seabrook, N. H.]

NOTES ON SOME SOUTH FLORIDA FERNS.

BY CHARLES LOUIS POLLARD.

I NOTICE in the current number of THE FERN BULLETIN a suggestion from Mr. B. D. Gilbert that our southern botanists should ascertain some definite stations for *Acrostichum lomarioides* in Florida. Although not strictly a "southern botanist," I am able to contribute positive information as to one station, for I discovered the fern a year ago growing abundantly near the village of Newport on Key Largo, south of Biscayne Bay. It was confined to a broad but shallow sink-hole in a clearing, forming a thicket so dense as to exclude all other vegetation. The soil was, of course, strongly alkaline, consisting of surface humus mixed with decaying coral rock; it may also have been slightly saline, as all the natural springs on these islands are more or less brackish. The characters separating this species from *A.*

aureum, already well pointed out by Mr. Gilbert, are ample for even the casual observer, the presence of sterile and fertile pinnæ on wholly separate fronds being especially marked.

On the same key, near the village of Aiken, our party unexpectedly encountered three of the typically southern Polypodiums. We entered a dark, moist forest, composed largely of madeira-wood and the Florida sumac, and were at once attracted by the glossy green fronds of *P. phyllitidis*, growing in large clumps directly on the ground. At first it appeared that this handsome species held undisputed sway over that particular woodland; but a little further examination revealed the delicate climbing stalks of *P. Swartzii* around the bases of the tree trunks, adhering so closely to the bark that they could not be removed except with the aid of a knife. It was too early in the season to obtain fruiting fronds, and I am inclined to believe that in this locality, at least, the fern does not fruit freely. The pinnæ are so delicate in texture that they do not survive the dry period from fall to spring, but start into fresh growth in March. While collecting specimens of *Swartzii* a single plant of what afterward proved to be *P. Plumula* was detected on a dead tree trunk. This fern, like *P. polypodioides*, withers and ceases to grow during the dry season, but the fronds remain evergreen so that they revive and turn green with the first rainfall.

Pteris caudata occurs frequently on these islands, particularly in the subtropical jungles of Sugar Loaf Key. It is impossible for one who has examined this noble fern under natural conditions to regard it as a mere variety of the familiar northern "brake." The fronds are much more decompose, the ultimate segments being uniformly narrowly linear. In stature it is above the average height of *P. aquilina*, numerous specimens exceeding six feet. Its habitat, almost invariably densely wooded thickets, is also characteristic, and its range is exclusively subtropical and tropical. I am convinced that much of the misconception has arisen from the fact that numerous specimens from northern localities have been wrongfully referred by collectors to "*P. aquilina*, var. *caudata*."

Pteris longifolia is one of the most abundant ferns on the keys, growing in various situations. At Miami, on the shore of Biscayne Bay, we also collected *Polypodium aureum* and *Vittaria lineata*, but neither of these were observed on the islands, probably because both species are epiphytic on the cabbage palmetto,

which is there replaced by various species of *Thrinax*. *Anemia adiantifolia*, more suggestive in appearance of a *Botrychium* than an *Adiantum*, is not uncommon on dry barrens throughout the keys, but it occurs in the greatest abundance around Miami. *Tænitis lanceolata* has been collected on Old Rhodes Key, which we found no opportunity to visit. *Blechnum serrulatum* and *Psilotum* probably also occur on the islands, or at least on the adjacent mainland; so far as I am aware, however, there are no other representatives of the Pteridophyta in this region. *Lycopodium* and *Selaginella* are conspicuous by their absence.

Of the species which we personally collected, four were epiphytic and six terrestrial, the large proportion of the former indicating the approach to tropical conditions which these islands afford.

Washington, D. C.

SOME VARIATIONS IN THE ADDER'S-TONGUE.

BY WILLIAM R. MAXON.

BY WAY of supplementing Mr. A. A. Eaton's interesting note entitled "Two Odd Ophioglossums," which appeared in THE FERN BULLETIN for January, 1897, I desire to call attention to two further examples of variation in the fruiting spike of Adder's-tongue. As in the second of Mr. Eaton's plants, my first specimen has the upper half of the fertile spike entirely sterile and leaf-like, the basal portion bearing several apparently normal sporangia, seven on one side and five on the other (Fig. a). The spike is about three-fourths of an inch long, rather undersized for the size of the plant. The unusual form is, as Mr. Eaton suggested in the case of his specimens, undoubtedly an instance of reversion; and it may be taken to indicate somewhat imperfectly a former stage in the evolution of the plant, when the specialization of the fertile parts had not been carried to the extent which we observe to-day in the almost complete elimination of the foliage feature in the normal fruiting spike.



Fig. a

The second case of variation is that of simple furcation of the fertile spike near its tip. This is a phenomenon which, by numerous observations published from time to time in THE



Fig. b

FERN BULLETIN, has been proven to be of by no means rare occurrence, even common in several species, and to which probably no especial significance need be attached. The accompanying illustration (Fig. *b*) shows the form of the spike fairly well, however, and may be of interest. Both figures represent natural size.

Washington, D. C.

DRYOPTERIS SIMULATA IN NEW YORK STATE.

BY WILLARD N. CLUTE.

SO FAR as I am aware, there was no known station for *Dryopteris simulata* in New York, until I discovered it at Babylon, Long Island, in 1898. This, however, appears not to be the earliest record of it from the State, since Miss Nellie Mirick sent Mr. Davenport a frond collected near Oneida, which he identified as this species, but unfortunately the exact locality in which the frond was found is unknown. Considerable interest, therefore, has attached to the Babylon locality. There it grows in a boggy stretch of ground in company with the cinnamon fern, the narrow-leaved chain fern and the marsh fern, in the shade of maples, black gums, Viburnums and the poison sumac.

On July 21st last, while returning from the Babylon locality by wheel, I found a second station about fifteen miles further west, in which the fern grows in such luxuriance and profusion that it may be doubted whether any other locality can surpass it in this respect. The station is along a little stream which divides the towns of Merrick and Bellmore. A dense growth of very tall and slender cedars here make a cool, semi-twilight even on the brightest days. In this dense shade representatives of the summer flora are rare, although the occurrence of such species as the violet, Solomon's seal and chickweed-wintergreen indicate that earlier in the year, flowers are more abundant. The ground is carpeted in many places with sphagnum moss, in which *Woodwardia angustifolia* and *Osmunda cinnamomea* abound; but the most prominent feature of the underwood is *Dryopteris simulata*, great banks of which are scattered among the shallow thickets of mountain laurel, at a short distance resembling similar banks of the New York fern, except that the latter is scarcely ever so luxuriant. Fronds three feet in length were common.

Simulata's two nearest of kin, although not common, were to be found and gave an excellent chance for comparison. After

seeing them thus, one would scarcely again confound *simulata* with *Thelypteris*; all its resemblances are toward *Noveboracense*, especially in the color and texture of the frond and in the graceful half-drop of both fertile and sterile fronds. *Simulata* is probably the most graceful of the three. The fronds of *Thelypteris* in comparison with those of *simulata* appear dull blue-green and the stipes are much darker. The stipes of *simulata* are yellow-green and as long in proportion to the blade as are those of *Thelypteris*. When growing in masses, *simulata* has a characteristic way of bringing forward the lowest pair of pinnæ until they are almost at right angles to the plane of the upper part of the frond, in appearance forcibly reminding one of the lower pinnæ of the beech fern.

Simulata is like *Noveboracense* in presenting a pretty complete series from sterile to fertile fronds. I cannot agree with the opinion that it is later to fruit than its congeners. In the third week in July I found plenty of ripe sporangia, although the wholly fertile fronds were scarcely fully matured. At the date it was collected, the fertile fronds of *Noveboracense* in the same locality were probably three weeks old, but those of *Thelypteris* were just appearing.

FERN STEMS.

BY C. E. WATERS.

AFTER one has become pretty well acquainted with the ferns around him, and does not have to turn to his manual whenever he comes across one of these plants, some time can be spent very pleasantly in examining portions of the plants which are usually ignored. It is especially interesting to compare corresponding parts of various species, noting the manner of uncoiling when the young fronds come up, the tendency to produce forked fronds and pinnæ, etc. To me the stems have for a number of years been of especial interest, for in many cases they are quite as distinct in the various species as the cutting of the fronds. My attention was first called to them by remarks in Eaton's "Ferns of North America," and as early as 1891, having just found *Dryopteris spinulosa* in the midst of a lot of *Asplenium Filix-femina*, any lingering doubts of its identity were banished from my mind by a glance at sections of their respective stems.

A fern stem is not merely a round stick, without individuality. If one cuts across it with a sharp knife, one or more light dots or lines will be seen near its center. These are the cut ends of the fibrovascular bundles. They serve as the main arteries of the plant, and at the same time give it strength and firmness. If we crush an *Osmunda* or other succulent stem, we can pull out these fibres in long pieces and test their strength with results that will probably surprise us. That the fibrovascular bundles are arranged so as to give the greatest strength to the stem is admirably shown in such species as *Dryopteris acrostichoides* and *D. marginalis*, where the two largest bundles are at the front or upper side of the stem, so that when the frond curves over naturally, these strong fibres are on the convex side, and thus prevent bending too far.

Many ferns, even those not growing on rocks and therefore not needing scaly fronds as a protection against drought, have very scaly stems. During the winter these scales serve to protect the young fronds, not from freezing, as is often stated, but from sudden alternations of cold and heat. In the case of the mature fronds, extended observations would be necessary to decide whether the scales protect the fruit dots from the attacks of insects that must creep up the stem. It is well known that hairs, etc., on the stems of flowering plants often prevent the removal of the pollen by improper insects.

The questions of specific differences and group resemblances are most interesting ones. Many stems can be recognized at a glance—for instance that of *Onoclea Struthiopteris* with its V-shaped cross-section. An *Osmunda* stem is recognized by its curiously rolled up fibrovascular bundle. That of the cinnamon fern differs from that of *O. Claytoniana* chiefly in lacking two slight lateral ridges. The stems of *Asplenium Filix-femina* and *A. acrostichoides* differ from others in having on each side near the rhizome several tooth-like projections. Some botanists place these two species under separate sections of the genus. These peculiarities do not tend to strengthen this position. They are wanting in *A. angustifolium*.

Asplenium platyneuron, *A. Bradleyi* and *A. montanum* form an interesting series. *Bradleyi* is clearly intermediate between the other species as far as its texture, shape of pinnæ, etc., are concerned, and Prof. Eaton went so far as to say that if there were a hybrid between *platyneuron* and *montanum*, it would very closely resemble *Bradleyi*. Of course it is not considered a

hybrid. On examining the stems we see that these show a regular gradation. In *platyneuron* the rachis is grooved in front. In *Bradleyi* the rachis and upper part of the stipe is grooved, with a slight ridge down the center of the groove; and in *montanum* the stipe has two parallel grooves. The existence of two grooves in the stem of the last species might be looked upon as caused by the further growth of a slight ridge down the center of a single groove like that of *montanum*. The stipe of *platyneuron* shows no traces of a ridge, groove, or even flattening in specimens that I have examined.

Baltimore, Md.

THE BOULDER FERN OR FINE-HAIRED MOUNTAIN FERN.

A STRIKING illustration of the fact that a scientific name long applied comes often to be the generally accepted common name for the plant is well shown in the last number of THE FERN BULLETIN, in the article containing a description of a new variety of the fern long known under the name *Dicksonia punctilobula*, for which, however, it is therein proposed to substitute the older name, *Dennstaedtia punctilobula*. An apparent anomaly arises from the fact that the article is entitled "A Variety of *Dicksonia*," *Dicksonia*, the discarded scientific name, being used as the *common* name for the plant. The usage seems, however, to be justifiable from the fact that *Dicksonia* is probably oftener heard than the more cumbersome and not altogether appropriate title of "Hay-scented fern." It is a case where the scientific name has become the general one. Fully as acceptable as either is "Gossamer fern," a name cited by Lawson in his "Fern Flora of Canada;" and, when we consider the singularly delicate and feathery appearance of the graceful fronds, the name seems especially appropriate. However, popular names are not to be made at will; and if *Dicksonia* has come to be generally accepted as the common name, it is unlikely that another will replace it, at least for some time.—*William R. Maxon, Washington, D. C.*

—In the *Bulletin of the Torrey Botanical Club* for July, Mr. B. D. Gilbert describes two new ferns from New Zealand, one of them, *Polypodium vulgare auritum*, being nearly related to our common representative of this genus.

FERNS OUT OF PLACE.

THE Pine Barrens of New Jersey contain comparatively few ferns, at least in the southeastern part of the State. The dry, hot stretches of sandy wood or thicket do not attract this moisture-loving tribe, and even along the borders of the streams and bogs, where fairly favorable conditions for their growth are found, they are by no means plentiful. In a journey of some forty miles through the most barren of the "barrens" last July, the only species found were the bracken, royal fern, cinnamon fern, common chain fern and *Schizæa*. We were therefore somewhat surprised, upon coming to a well somewhere in the midst of this inhospitable region, to find in its moss-covered depths four species of ferns which had apparently strayed long distances from their native haunts. These four were the oak fern (*Phegopteris Phegopteris*), the lady fern (*Asplenium Filix-femina*), the ebony spleenwort (*A. ebeneum*), and one of the wood ferns (*Dryopteris spinulosa*, var.). As regards the oak fern, the "Catalogue of Plants Found in New Jersey" gives but two stations for it, both in the northern part of the State. The ebony fern is reported by the same authority to be "frequent throughout the State," but Mr. C. F. Saunders has noted in this journal (6:23, 1898) that he has never discovered it upon frequent trips to these barrens. The lady fern has been found in the same county, but was not seen on our trip, while the wood fern has before been found only in the northern part of the State so far as known. How these ferns came to meet in this old well, so far from their kindred, is something of a puzzle. If, as it appears, they originated from spores blown from the nearest station, some of them must have traveled a hundred miles or more. And it is still a question whether these are merely adventitious spores which happened to find a footing, or whether such spores are constantly rained upon the region only to die without a sign.—
W. N. C.

ASPLENIUM EBENOIDES—A CORRECTION.

IN THE paper presented by Mr. Davenport at the Boston meeting, he entirely misunderstands the distribution of this species and its supposed ancestors at Havana Glen, Alabama. Both *Camptosorus* and *Asplenium platyneuron* grow at the glen, but only a single small area of *Camptosorus* was found and that at a

distance of full sixty rods from the nearest growth of *Asplenium ebenoides*, and on the side of a sloping fallen boulder in the bed of the creek. *Asplenium platyneuron* grows more commonly, usually at the base of fallen rocks or cliffs, while *Asplenium ebenoides* has a habit utterly unlike either of its supposed parents, growing far under widely overhanging cliffs and higher above the stream than either of the other ferns mentioned. No one can secure any environmental evidence that this species is a hybrid from visiting Havana, and any one who will compare Mr. Davenport's interpretation (page 9, report of Boston meeting) with the facts as stated above, will see how his "ideal situation" for producing a hybrid fern melts away when we base our speculations on facts rather than upon inaccurate reports.—*L. M. Underwood.*

Columbia University July 3, 1899.

DISTRIBUTION OF THE RUE SPLEENWORT IN OHIO.

By W. A. KELLERMAN, PH. D.

ONLY one locality in Ohio is known, so far as I am aware, for *Asplenium ruta-muraria*. Specimens have been sent from different counties of the State from time to time labelled as this species, but they have invariably proved to be *Asplenium montanum*. Years ago *Asplenium ruta-muraria* was found by Mrs. E. J. Spence, of Springfield, and Professor Claypole, formerly of Yellow Springs, in the Clifton Gorge in Greene county, Ohio. This beautiful little gorge, about three miles long, cut in the Niagara formation, is the home of many ferns mosses, liverworts, and not a few interesting flowering plants. I have visited the place several times in vain search for *Asplenium fontanum*, said to grow at "Springfield, Ohio; the rarest North American fern," apparently a mistaken reference on the part of Professor Underwood. But it was a delight to see the quantity of *Asplenium ruta-muraria*—specimens to burn—from one end of the gorge to the other, though Professor Claypole would tell no one of the "only locality in which it grew years ago," lest it might become exterminated.

Ohio State University, Columbus, O.

—Miss Mary F. Miller reports finding in a forest in the Catskill mountains two plants of *Botrichium lanceolatum* with well-developed sporangia, or what would normally be the sterile part of the frond.

LYCOPODIUM ALOPECUROIDES.*

MR. ALVAH A. EATON, in the January, 1897, number of THE FERN BULLETIN, published an announcement of his supposed discovery of *Lycopodium alopecuroides* in Massachusetts, but it seemed to me, at the time, that his description of the plants collected by him on Plum Island pointed quite clearly to *Lycopodium inundatum* L., var. *Bigelovii* (Oakes) Tuckerman.

But, while I feared that he had mistaken the latter for the southern species, until quite recently I have had no means of verifying my suspicion. Now, however, specimens have come into my hands for examination that were sent out from his own collection, and under his own label, and I find, as I suspected, that his Plum Island plants are *L. inundatum*, var. *Bigelovii*. *L. alopecuroides* therefore remains yet to be discovered east of New Jersey.

It is a little singular that so well marked a plant as *Bigelovii* should not have been even mentioned in the "Illustrated Flora," although it has been collected time and time again in Eastern Massachusetts, and is a much more distinct plant than a great many varietal forms that are being elevated to specific rank.—*George E. Davenport*.

[Since the above was written the editor has sent Mr. Davenport specimens of a *Lycopodium* from Babylon, Long Island, which he pronounces true *alopecuroides*. This, therefore extends the range of this species if Mr. Eaton's locality does not hold. Jelliffe's "Flora of Long Island" also records this species from East Hampton, near the eastern end of Long Island, but apparently no specimens are on record to substantiate the claim.—ED.]

THE SEQUENCE OF THE CINNAMON FERN'S FRONDS.

ONE who carefully examines the cinnamon ferns will notice that the sterile and fertile fronds of both *cinnamomea* and *Claytoniana* belong to different cycles of growth. First to start are the fertile fronds, and after they have begun unrolling the sterile fronds come up from a circle of buds *inside* the circle of fruiting fronds. The stipes of the sterile fronds bend sharply outward at base, which causes their green blades to form the outer circle at maturity. There are doubtless many who have always fancied the cinnamon-colored spikes to belong to the second or

*Read before the New England Botanical Club, March 3, 1899.

inner circle of the fern's crown of fronds. This method of growth may throw some light upon the origin of the *frondosa* form of *O. cinnamomea*. No one doubts that *frondosa* is simply an intermediate form between fertile and sterile fronds similar to the variety *obtusilobata* of *Onoclea sensibilis*. Picking off the sterile fronds of this fern will often so decrease the plant's vitality that it is forced to turn the fertile fronds, already partly formed, into organs of assimilation, and this form is the result. But in the cinnamon ferns, since the fertile fronds come first, picking off the sterile fronds is likely to have no other effect than to cause the whole plant to be sterile the following year. It appears that the fertile fronds are found very late in the year, for if the fronds are cut off in summer, the plant is able to produce a new set of sterile ones. To produce the variety *frondosa*, therefore, some cause which would lower the fern's vitality *after* the fronds for the next year are partially formed, would seem to be needed, and the theory that finds this cause in a fire burning over their haunts in late autumn is likely to be the correct one.—*W. N. C.*

THE TENNESSEE LOCALITY FOR THE HART'S-TONGUE FERN.

BY JAMES H. FERRISS.

THE last week in July I made a trip from Chattanooga to South Pittsburg in search of the locality for *Scolopendrium*, described to John Williamson by his correspondent, and narrated in the *Torrey Bulletin* about 1880. South Pittsburg is just a dollar's worth from Chattanooga by rail, a thriving manufacturing town at the foot of the Cumberland mountains near the Tennessee river. With the aid of a small boy, I found the locality described about two miles southwest of the city, where a spring branch empties into a fissure, cave or well in the limestone, about sixty feet in depth.

There is a similar cavern near by, called the Devil's Den, which I also visited. A family lives between the two, no more than 200 yards from each, and these, they told me, were all the caverns of that nature in the vicinity. I found the poles left in the caverns, probably by Mr. Williamson's correspondent, and I found the walking fern and many other varieties, but nothing of *Scolopendrium*. In this locality I found *Cheilanthes Alabamensis* and *Asplenium pinnatifidum*. In other localities of Tennessee and

Kentucky I found *Asplenium montanum*, *Adiantum capillus-Veneris*, *Botrychium dissectum*, the climbing fern and many other varieties desirable for my collection, and brought home several baskets full of live plants.

At Oakdale, Tenn., on the Emery river, I found two or three specimens of the climbing fern (*Lygodium palmatum*) opposite the hotel and kept my eye over my shoulder, fearing that I might be interrupted in the collecting. But afterwards I found a bank on the railroad track a couple of miles north of the hotel where they grew by the hundreds. Some were five feet in length, and every handful of moss contained a half-dozen specimens.

Joliet, Ill., Sept. 9, 1899.

OUR MISCELLANY.

Dr. Thomas C. Porter reports the discovery of two stations for *Cheilanthes lanosa* near Easton, Pa., one on rocks in the neighborhood and the other six miles above at Martin's Creek, where *Phegopteris Phegopteris* also grows plentifully.

Those who have given directions for distinguishing between *Botrychium obliquum* and *B. Virginianum* seem to have overlooked the important fact that when *Virginianum* is fruiting, *obliquum* has not begun to come up. This is apparently later to develop than any other of our native species.

In some sections of Pennsylvania mountaineers make use of the early shoots of *Pteris aquilina* as a vegetable, boiling it as they would asparagus. This is one of the few instances of a fern being used as food. The species is very abundant in ground over which forest fires have passed.—C. F. Saunders.

This part of my paper would certainly be incomplete did I omit reference to the immense fertility of the fern tribe in the way of spores. Six dead and withered fronds of my original plant of *A. f. f. Victoriae* yielded me by careful computation 80,000,000 of spores still unshed. Any fertile fern of fair size affords a nice sum in multiplication, each capsule containing say fifty spores, each heap several scores of capsules, each pinnule several heaps, each pinna a number of pinnules, each frond a score or so of pinnae, and the plant a fair number of fronds. Multiply all these together and you will have an appalling string of noughts following a very decent figure before you have done.—Charles T. Drury, before the British Pteridological Society.

EDITORIAL.

BACK NUMBERS

The first three volumes of this journal were issued by the Fern Chapter for circulation among its members, and long ago most of the numbers went out of print. The next two volumes are now in the same condition. While we do not attach much importance to these early numbers, issued in what might be called the prothallium stage of the BULLETIN, we sympathize with those who are trying to complete their files and hope that any of our readers who may have extra copies of the numbers desired will communicate with those who advertise in our want column. These early numbers will not be reprinted, and stray copies must be looked for completing files. We would also call attention to the fact that the sixth volume is now nearly out of print.

* *

A GREAT FERN MEETING

It has been decided to hold the next annual meeting of the American Association for the Advancement of Science in New York City. This news comes too late to permit of any action being taken by the Fern Chapter before this issue goes to press, but it is certain that so excellent an opportunity for another meeting of fern students will not be allowed to pass. The enthusiastic session at Boston last year, which brought together nearly a hundred persons, showed the value of such meetings. New York has more fern students than Boston and should have a larger meeting, especially as we shall expect every one who attended the Boston meeting to attend this one also. Further particulars will be given in the next issue of this journal.

* *

FERN COLLECTIONS

Those who make collections of ferns usually have the single object in view of getting together as many different species as possible, and when a good representative of each is obtained, seldom or never collect more of the same species. But when it is considered that in North America, north of Mexico, there are less than two hundred species of ferns, and that fully one half of these are so rare or so difficult to obtain that none but the most fortunate of collectors can hope to obtain them, the limit of this sort of a collection is not difficult to see. As soon as such a collection is practically completed, the interest of the collector wanes for want of new forms to excite it. Three or four years is usually sufficient

for this collecting fever to run its course, and then the ferns are forgotten in collecting something else. There is, however, a better kind of fern-collecting—a kind which inclines the one who once begins it to always be a fern student, and which in a measure satisfies him with such species as are found in his own vicinity. This consists in collecting everything relating to ferns that will throw light upon their life histories. Why should we be content with the mere tops of ferns—tops although broken off at the surface of the earth—and think our collection complete when it still lacks rootstocks, prothalli, fronds in bud, young fronds and all the curious and wonderful variations of the mature plant? When one begins a collection of this kind, the commonest species acquires a new interest and no woodland or rocky ledge can ever be considered exhausted of its treasures, when some remarkable form may appear there at any time. For the same reason collections of common ferns from other localities are of value. Until one has specimens of the same plant from its extremes of range, he can form no conception of the *average* of the species, and does not know whether the specimens of his own locality are typical or not. The ideal collection for a student is one that contains representatives of each species from as many different localities as it is possible to obtain them.

* *

THE GENUS Mr. Eaton's article in this issue on the genus
EQUISETUM Equisetum is the first of the series to be illustrated,
and he has accordingly prepared for distribution
sets of all but one of the varieties mentioned, the
missing one to be supplied later. Since the following articles
upon the other species are to be illustrated in this unique way,
there is likely to be a large demand for the series, and those who
would not be disappointed should order early. In case the supply
falls short, those who are too late will be sent the first sets of the
next distribution.

* *

DICKSONIA The editor pleads guilty to writing the headings
for both of Mr. Maxon's articles on Dicksonia.
This explanation will clear the latter from any sus-
picion of confusion in regard to terms and allow us to notice the
fact that this, one of the most beautiful of our common ferns, is
still without a *common* name. As will be observed, English
names in plenty have been given it, but none seem to have re-
ceived the sanction of popular use and approval, a most essential
requirement in a common name.

NOTES.

—The occurrence of *Equisetum palustre* in fair abundance along the Connecticut river near Long Island Sound, is recorded by Dr. C. B. Graves in *Rhodora* for April. This is a northern species, not hitherto reported south of northern Maine and the Vermont shore of Lake Champlain, according to the writer.

—Two specimens of Scott's spleenwort (*Asplenium ebenoides* R. R. Scott), one especially luxuriant and both finely fruited, were collected in July last by Dr. Thomas C. Porter on shaded limestone rocks along the Lehigh river, above Easton, Pa. This is a new station for this rare and interesting fern.

—In reference to the monstrosities of the field horsetail mentioned by Mr. Eaton in this number, it will be of interest to note that the *Plant World* for September contains an illustration of a forking stem bearing two perfect spikes, that was found in New York city in 1898.

—The collections made in the LaPlata region of the southern Rocky mountains by Mr. C. F. Baker last year, contained so many new and interesting things that he decided to spend all of the present season botanizing in the region just north of this. The determinations will be made by Prof. E. L. Greene, of the Catholic University, Washington, thus assuring their accuracy. Information in regard to sets of the plants may be addressed to Mr. Baker at St. Croix Falls, Wis.

BOOK NEWS.

Speculations regarding the origin of color in flowers have always been among the botanist's favorite themes. A new contribution to the subject, entitled "Observations on the Colors of Flowers,"* from the pen of E. Williams Hervey, is worth attention. The author does not quite agree with those who have preceded him in this field, and cites a multitude of species and many curious facts in support of his conclusions. What the author believes to be the first explanation of the origin of the honey guides in flowers, forms the concluding chapters. The pamphlet is well printed and is a pleasing addition to the literature of this much discussed subject.

*"Observations on the Color of Flowers," by E. Williams Hervey, New Bedford, Mass. E. Anthony & Sons, 1899. 8 vo. (paper). 105 pp. Price 75c.

There are many ways of acquiring a knowledge of plants, but few are more attractive than the one opened by Dr. Coulter in his recently issued "Plant Relations."† The appearance of this volume, which is unique in being entirely devoted to ecology, again emphasizes the importance that is being attached to this phase of the science. Opinions may differ as to whether Ecology or Morphology should have precedence in school and college courses, but there can be little doubt as to which is best for the general reader. He cares most to know how plants live and how they behave toward other plants and animals. In the fifteen chapters of this book the information will be found, set forth with a minimum of scientific terms and well illustrated. No part of botany stands in greater need of good illustration than ecology, and none lends itself more readily to it. The author has shown excellent taste in the selection of the more than two hundred cuts. A majority are photo-engravings and the rest are either original drawings or selections of the best of other works. The typography and paper are of the best. Although this is the first of two books designed expressly for school work, we can recommend it to every person who is interested in the larger relations of plants.

It is perhaps possible for one to make a good collection of plants without instructions, but the chances are the deeper the collector goes into the work the more he will find himself in need of some experienced friend to point out the easiest way of doing things in order to save labor. Such a friend may be found in Prof. Bailey's "Botanizing,"‡ a little book which treats the whole subject of herbarium-making and exchanging very thoroughly. Although beginners will find the book most useful, older collectors can glean many new ideas from its pages. Especially to be commended are the directions for collecting certain families of plants requiring special treatment. These have been written by acknowledged specialists in their lines of work. In most of its statements the book is up-to-date. It is neatly printed and of a convenient size for the pocket, the latter a very desirable feature in a manual of this kind.

† "Plant Relations, a first book of botany," by John M. Coulter, A. M., Ph. D. New York: D. Appleton & Co., 1899. 12-mo., 255 pp. Price \$1.10.

‡ "Botanizing, a guide to field collecting and herbarium work," by William Whitman Bailey. Providence, R. I., Preston & Rounds Co., 1899. 16-mo., 142 pp. Price 75 cents.

THE LINNAEAN FERN CHAPTER

OF THE AGASSIZ ASSOCIATION.

Election of Officers.

The seventh annual election of officers for the Chapter will be held in October. The following list of candidates has been prepared by the Executive Council as directed by the Constitution, but this is not intended to prevent members from voting for whom they choose, even if not regularly nominated. Should a person thus voted for receive the highest number of votes, he would be declared elected.

For President—William R. Maxon, Washington, D. C.; C. F. Saunders, Philadelphia, Pa. *For Vice-President*—B. D. Gilbert, Clayville, N. Y.; Miss Margaret Slosson, Pittsford, Vt. *For Secretary*—Prof. W. A. Murrill, Ithaca, N. Y.; H. A. Green, Chester, S. Car. *For Treasurer*—James A. Graves, Susquehanna, Pa.; Dr. A. J. Grout, Brooklyn, N. Y.

President Eaton has appointed Miss L. F. Kimball, National City, San Diego county, Calif., as Judge of Elections. All votes should be sent to her, preferably by postal. Any member who has paid dues for this year is entitled to vote. Balloting begins Oct. 1st and ends Nov. 1st. Vote early.

—The Annual Report of the Fern Chapter was recently sent to all members. This pamphlet also contains the new constitution of the Chapter and correct list of members up to September of this year. The constitution is also reprinted separately, and a copy will be gladly sent to any one who is contemplating joining the Chapter.—C.

—For the first time in our history a Judge of Elections has been selected from the Pacific coast. This brings home to us all, in a new way, the extent and strength of our Chapter. The new constitution gives all those who were formerly classed as associates a right to vote in the election. We hope all will take advantage of it. And every active member should have interest enough in selecting a good set of officers for the Chapter to vote in this election. A postal card for voting is preferred.—C.

THE BRYOLOGIST,

A DEPARTMENT OF THE FERN BULLETIN,

DEVOTED TO THE STUDY OF NORTH AMERICAN MOSSES.

ISSUED QUARTERLY.

EDITED BY DR. A. J. GROUT, BOY'S HIGH SCHOOL, BROOKLYN, N. Y.

To whom all correspondence regarding the mosses should be addressed.

This department is issued separately at twenty-five cents a year, by the Fern Bulletin Co., Binghamton, N. Y. Subscriptions should be mailed to this address.

VOL. II.

OCTOBER, 1899.

No. 4.

KEY TO THE MNIUMS OF NORTHEASTERN NORTH AMERICA.

1. Leaves not bordered 3.
Leaves bordered 2.
2. Plants large, leaves entire or very slightly serrate by projecting cells; leaf cells twice as long as broad
M. cinclidioides.
Plants much smaller, leaves usually serrate; leaf cells isodiametric (*i. e.*, as broad as long) *M. stellare*.
3. Leaves entire 7.
Leaves serrate, with single teeth 4.
Leaves serrate, with teeth in pairs II.
4. Leaves costate to apex *M. punctatum*.
Costa vanishing below apex 5.
5. Upper leaf cells isodiametric *M. hymenophylloides*.
Upper leaf cells longer than broad 6.
6. Margin of leaves thickened, of 2-4 layers; dioicous; capsule oval. *M. punctatum*, var. *elatum*.
Margin of leaves not thickened; synoicous; capsule roundish. *M. pseudopunctatum*.
7. Basilar branches stoloniform; capsules single or clustered. 8.
Basilar branches erect or stems simple; capsules clustered *M. Drummondii*.
8. Leaves rounded at apex, mucronate; operculum rostrate.
M. rostratum.
Leaves acuminate; operculum mamillate or apiculate. 9.
9. Leaves serrate to base, teeth usually more than one cell in length 10.
Leaves serrate to middle, teeth consisting of a single cell.
M. sylvaticum.
10. Dioicous; operculum mamillate *M. cuspidatum*.
Synoicous; operculum apiculate *M. medium*.

11. Costa vanishing below apex *M. hornum*.
Costa reaching apex 12.
12. Costa toothed on the back; dioicous 13.
Costa not toothed on the back; synoicous 14.
13. Costa excurrent in upper leaves; leaf cells 0.18-0.030 mm.
Costa percurrent; leaf cells about 0.015 mm. *M. pseudolycopodioides*.
. *M. orthorrhynchum*.
14. Capsules clustered *M. spinulosum*.
Capsules solitary *M. marginatum*.

It is to be regretted that the question of plant names should arise to bother beginners, but many of those in Lesquereux and James' Manual are untenable. We have chosen to use the nomenclature of Braithwaite's "British Moss Flora," which is also followed in the editor's "Vermont Mosses." Mrs. Smith very kindly contributes a table of synonyms.

In using the key it will be well to remember that *M. cuspidatum*, var. *rugicum* often has entire leaves. The American *M. lycopodioides* of L. & J. is doubtfully the same as the European plant of the same name, and hence was called *M. pseudolycopodioides* C. M. & Kindb. Mrs. Britton informs us that the plant we described in the July issue as *M. punctatum* is really the variety *elatum*. The variety grows on the ground in bogs, while the species grows on wet stones and is much smaller.

The writer has found *M. stellare* and *M. cinclidioides* abundant in Plymouth, N. H.; both sterile except a very few capsules of *M. stellare*. *M. stellare* grows on humus at the base of trees in swampy woods. *M. cinclidioides* in the swampy places near by; it resembles *M. punctatum*, var. *elatum* in appearance, but is easily distinguished by the non-margined leaves.

Mrs. E. G. Britton very kindly furnished us with a list of the Mniums of this region, and has promised an article on their habits and distribution for the January issue.—A. J. G.

SYNONYMS.

In the list of species of Mnium found in eastern United States the first name given is the one used by Dr. Grout in his keys. *B.* stands for Braithwaite, "British Moss Flora;" *L. & J.* for Lesquereux & James, "Manual of Mosses of N. A.;" *D. & J.* for Dixon & Jameson, "Student's Handbook British Mosses," and *H.* for Husnot, "Muscologia Gallicæ." In cases where any of these authorities are omitted, it means that the moss is not treated by those authors:

1. *M. ciliare* (Grev.) Lindb. = *M. affine*, var. *ciliare* (Grev.) C. M. See Limpricht "Laubmoose," p. 479.
2. *M. cinclidioides* (Blytt) Hüb. of B. = *M. cinclidioides* Hüb. of L. & J. and D. & J. and *M. cinclidioides* Blytt. of H.
3. *M. cuspidatum* (L.) Neck. of B. = *M. affine* Bland. of L. & J. and D. & J. and *M. affine* Schw. of H. Its varieties are *M. affine*, var. *elatum* B. & S. of authors cited. *M. affine*, var. *rugicum* B. & S. of L. & J. and D. & J. = *M. affine*, var. *rugicum* Laur. of B.
4. *M. Drummondii* B. & S. of L. & J.
5. *M. hornum* L. Same by four authors cited.
6. *M. hymenophylloides* Hüb. of L. & J. and H.
7. *M. marginatum* (Dicks.) P. Beauv. of B. & H. = *M. serratum* Laich. of L. & J. = *M. serratum* Schrad. of D. & J.
8. *M. medium* B. & S. of L. & J. = B. note Vol. II., p. 243 = *M. affine* Schw., var. *medium* of H.
9. *M. orthorrhynchum* B. & S. = Same by all authors cited.
10. *M. punctatum* Hedw. of L. & J. and H. = *M. punctatum* L. of B. and D. & J. *M. punctatum* Hedw. var. *elatum* B. & S. of L. & J. and H. = *M. punctatum* L. var. *elatum* Schimp. of B. and D. & J.
11. *M. pseudopunctatum* B. & S. of B. = *M. subglobosum* B. & S. of L. & J., D. & J., and H.
12. *M. pseudolycopodioides* C. M. & Kindb. = *M. lycopodioides* (Brid.) Schwagr. of L. & J. See note under key.
13. *M. silvaticum* Lindb. of B. = *M. cuspidatum* Hedw. of L. & J. and H.
14. *M. spinulosum* B. & S. of L. & J. and H. See note, D. & J., p. 348.
15. *M. stellare* Reich. of all authors cited.
16. *M. rostratum* Schrad. of B. and D. & J. = *M. rostratum* Schwagr. of L. & J. and H. — *A. M. S.*

SOME ADDITIONAL NOTES ON THE METHODS OF MICROSCOPIC EXAMINATION OF MOSSES.

BY JOHN M. HOLZINGER.

THE electric current runs along the line of least resistance. So, in our working methods on mosses, we strive to find a plan that shall lead to results exact and satisfactory by a way most direct and least expensive of time and tools. I have read with interest the article on this subject in the April *BYVOLOGIST*; and since my own method of work is in part different from those described, I gladly furnish it to our younger moss students,

hoping that some of them may try it and find it as satisfactory as the writer.

In the first place, I invariably prepare my dry material for examination by simply soaking it in a tumbler of cold water for a sufficient length of time. The usual time required for examining one moss is almost always sufficient to soak up the next victim. The only time when a moment's boiling over a flame becomes necessary is when spores interfere with the study of the peristome, after the dissection of a recently ripe and still operculate capsule.

In the second place, I work almost entirely with mounted needle and small convex edged scalpel *under* the arm-supported lens of a dissecting microscope, whether it be in removing leaves from stems, for examination entire, or in making sections of leaves, or of stems, or of capsules, or in searching for gametophytes and sporophytes. I remove only the largest leaves, as of *Polytrichum*, of some *Mniums*, etc., with simply scalpel and tweezers. I suppose every one can work best by that method to which he has become accustomed, and in which he has become practiced, from the beginning, whether it involves the use of pith, or simply of the thumb-nail and razor. But I believe the method I have suggested is, on the whole, the simplest, most certain and most satisfactory, because most expeditious. May I tax the patience of my readers with one illustration?

Suppose I have soaked up some plants of an *Orthotrichum* which occurs around Winona on limestone boulders, for critical study. I carefully select a plant as perfect as possible, *i. e.*, with leaves unbroken, and fresh, with a fully ripe capsule, but not so old as to have a demoralized peristome, placing it on a glass slip in as much water as will adhere to it. This slip is put on the dissecting stage, under the lens, to be cursorily examined. If earth, sand or vegetable debris adhere to it, I endeavor with needle and scalpel to float this superfluous material away from the specimen. I may wash it thus, on the glass slip, through several waters. When perfectly clean, it is ready for detailed dissection. I decide to examine leaves, both entire and in cross-section, the capsule wall, to determine whether it is cryptopore or phaneropore, and the peristome.

I remove several leaves from the base of my plant, carefully cutting off short pieces of stem from below up, and pressing off the lowest leaves with needle and scalpel. (In some cases I get good results readily by scraping the leafy stem downward, and

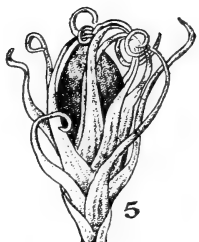
selecting those least broken up.) From a lot thus separated I select several for examination entire, removing them to another clean glass slip into a drop or two of clean water, or dilute glycerine, and covering them with a cover glass. They are now ready for the compound microscope, and may be temporarily laid aside till all the other slips are prepared.

The preparation of cross sections of the leaves is a somewhat more delicate task. I again select three or four of the best leaves, and transfer them to another slip into a little water. Under the dissecting lens I now endeavor to hold them with bent needle down into the water on the slip, bases toward me and to the left, apex away from me and toward right. This with the left hand. Then I cut with a chop-knife motion across the leaves, endeavoring to cut very thin, parallel slices. The scalpel of course must be kept very sharp, and I always keep a fine hone and razor strop on my work table. The difficulty of this operation, which is viewed through the lens, is fast diminished by practice. It arises from the surface tension of the water, which is somewhat violently disturbed by the touch of the scalpel, on the edge of which a meniscus leaps up to a microscopically considerable height, causing the small moss pieces to dance a lively jig for a moment, and throwing them into confusion. With this disturbance one soon learns to reckon in this process of working. The thinnest sections are soon selected, and are lifted with needle and scalpel on to another slip into a drop of water or glycerine, and covered with a circle.

The capsule I cut crosswise first, close to the peristome. If spores are too abundant, and are likely to interfere with the examination, I endeavor to press and work out the bulk of them, transferring the washed parts to another slip with a drop of water. Then I split each part again lengthwise; the base of the capsule thus split is carefully laid with outer surface turned *upward*; the peristome pieces are arranged so that one has the *outer*, the other the *inner* surface turned upward, for obvious reasons. The parts are then covered with a cover glass, and everything is ready for a detailed microscopic examination.

Finally, if it is found necessary to determine the presence of the gametophyte on the plant, as perfect a plant as possible is selected after soaking, and is carefully looked over with the dissecting lens for small buds of somewhat different construction than ordinary short stems. These buds are then split lengthwise in a drop of water, the parts floated out, and covered.

ILLUSTRATED GLOSSARY—Continued.



Circinate, curved into a circle, resembling fig. 2, but still more incurved so that the apex is nearly or quite bent around to the leaf base; *e. g.* leaves of *Hypnum uncinatum*.

Cirrate or *cirrhat*e, applied to leaves which curl up in drying. Cirrate leaves are more regularly curled than crispate leaves.

Cirrrose, having a wavy hair point.

Cochleariform, rounded and concave like a spoon or ladle.

Complicate, folded together.

Costa, the nerve or midrib of a moss leaf,

Costate, having a costa.

Crispate or *crisped*, frizzled, curled and twisted in various ways. (Fig. 5).

Cucullate, hood-shaped, the apex curved in like a slipper. (Apex of leaf in fig. 6).

Cultriform, curved like a short, wide scimitar; *e. g.* the leaves of *Homalia trichomanoides Jamesii*.

Cymbiform, boat-shaped (used by Dixon as a synonym of cucullate); *e. g.* leaves of *Sphagnum cymbifolium*. (The whole leaf in fig. 6.)

Dorsal, belonging to or on the back; *i. e.*, the face of a leaf remote from the stem.

Ecostate, lacking a costa.

Excurrent costa, a costa running out beyond the lamina of a leaf. (Fig. 7.)

Excavate (leaf-insertion), hollowed out in a curve.

Falcate, curved like a sickle. (Fig. 2.)

Flexuose, bent backwards and forwards or waved.

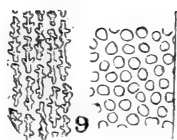
Hamate, or hamulose, curved like a hook; more sharply and abruptly curved than in *falcate* and *circinnate*.

Heteromallous, leaves or branches turned in different directions.

Homomallous, all turned in the same direction.

Imbricated, closely overlapping each other like the tiles of a roof. (Fig. 8.)





Incrassate, of the cell walls, thickened; of the cells, having thickened walls. (Fig. 9.)

Inflated, applied to the alar cells of leaves when enlarged much beyond the size of the neighboring cells. (Fig. 10.)

Lamellæ, thin sheets or plates of tissue; *e. g.* the plates arising from the costa of the hair caps and their allies. (Fig. 11.)



Lamellate, having lamellæ.

Lamina, the blade or expanded part of the leaf as distinct from the costa.

Limb, the upper part of a leaf as distinct from the leaf base.

Limbate leaf, a leaf bordered by a part of another color; *e. g.* many species of *Fissidens*.

cies of *Fissidens*.

Margined, see bordered.

Median leaf cells, those from the middle of the leaf.

Nerve, see costa.

Papillæ, minute rounded or acute protuberances.

Papillose, rough with papillæ. (Fig. 3.)

Paraphyllia, minute leaf-like or much branched organs among the leaves. (Fig. 12.)

E. g. Thuidium.

Parenchymatous, cells with broad ends abutting on each other, not dovetailing into each other. (The large cells in Fig. 4.)

Patent, spreading at an angle of 26° 45 (Braithwaite); spreading at an angle of 45° or more (Dixon).

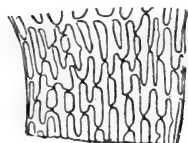
Patulous, more widely spreading than patent.

Percurrent costa, reaching to the apex of the leaf, but not beyond.

Perichaetial, see bracts.

Perigonal, see bracts.

Pitted cell walls, marked with small apertures or depressions; *e. g.* the cell walls of the leaves of *Dicranum scoparium* and other species.



THE SULLIVANT MOSS CHAPTER.

Elections.

As soon as this meets your eye, or at latest before Nov. 1st, send in your vote to the Judge of Elections, Mrs. M. L. Stevens, 6 Holyoke Place, Cambridge, Mass. For address of candidates, see list of members. For further instructions, see your copy of the Constitution. Candidates: For President, Miss Mary E. Hart, Dr. A. J. Grout; for Vice-President, J. F. Collins, Will R. Maxon; for Secretary-Treasurer, Mrs. Annie Morrill Smith, Miss Harriet L. Wheeler, of Chatham, N. Y.

A. J. G., J. F. C., A. M. S.

Do not forget to send Mrs. Smith an account of your work at once, that she may make out a yearly report to gladden all our hearts. This means every active member, and we shall be pleased to hear from the associates.

—Mr. J. W. Huntington has collected *Hylocomium squarrosum* and *Dicranum montanum*, in Amesbury, Mass.

—Mrs. Annie Morrill Smith, 78 Orange street, Brooklyn, N. Y., plans a revision of the *Timmiaceæ*, and wishes both European and American specimens for examination, or she will exchange in case any one has duplicates to spare.

—The notice of the Columbus meeting nearly crowded out Chapter notes in the last issue, but we hope to make up for it in this. The members of the Chapter have not been idle, and we shall have a fine lot of notes in our next number. We hope every member of the Chapter will collect all the Mniums possible and be ready with notes. Mrs. Britton has promised us an article for the January number that will give complete ranges so far as known of all the Eastern species. Mrs. Britton has made a special study of the genus, and her article and notes will be of the greatest value.—G.

Mosses for Distribution.

By A. J. Grout, Boys' High School, Brooklyn, N. Y.: *Mnium cinclidioides*, str. and *M. stellare*, str., for five cents in stamps. *Dicranoweissia cirrhata* (L.) Lindb., by Cambridge Botanical Supply Co. for a self-addressed stamped envelope. Will persons who can offer other species than those already offered please notify the editor?

30 cts. per Year
15 cts. per Copy.

Vol. VIII.

No. 1.

The

LIBRARY,
NEW YORK
BOTANICAL
GARDEN.

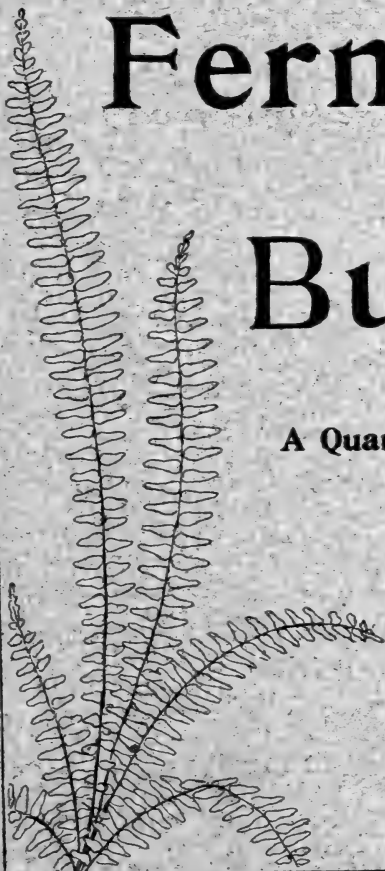
Fern

Bulletin.

A Quarterly Devoted to Ferns.

JANUARY.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1900.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

If this paragraph is marked, your subscription expires with this number. To avoid misunderstanding, the journal is not sent beyond the time paid for, unless we have been notified that the subscriber desires it, and a prompt renewal will be necessary to keep your files complete. Copies lost in the mails replaced free if we are notified at once. We have no back numbers earlier than Vol. VI. **Personal checks must contain ten cents extra for collection.**

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter

THE LINNAEAN FERN CHAPTER.

PRESIDENT, W. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, PROF. W. ALPHONSO MURRILL, Cornell Univ., Ithaca, N. Y.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information

WANTS AND EXCHANGES.

Special announcements inserted here, for One Cent a word. No notice received for less than 25c. No charge for address.

WANTED—*Fern Bulletin* Vol. V, No. 3, to complete set. Address, T. J. Fitzpatrick, Lamoni, Iowa.

FOR SALE—"Ferns of Iowa and their Allies," a 14-page descriptive pamphlet of interest to fern lovers. Only a few copies left. Price 10 cents. Address, T. J. Fitzpatrick, Lamoni, Iowa.

WANTED—LINNAEAN FERN BULLETIN, Nos. 6, 7, 11 and 12. A copy of "Ferns of the Upper Susquehanna" given for each number, or 10 cts. each allowed in exchange. Address, THE FERN BULLETIN.

WANTED—LINNAEAN FERN BULLETIN, Vol. IV, Nos. 1 and 3, and Vol. V, Nos. 1, 3 and 4. Miss Caroline Harriot, Whitestone, Borough of Queens, New York City.

FOR SALE—Four copies of FERN BULLETIN Vol. IV, No. 4, and one copy No. 10. Price 25c. each. R. H. Rich, Box 1422, Beverly, Mass.

WANTED—*Asa Gray Bulletin*; Whole Nos. 1, 2, 3, 5, 6, 7; 1895—Nos. 2, 3, 4; 1897—No. 5. G. L. Parmele, 65 Pratt St., Hartford, Conn.

WANTED—FERN BULLETIN for January, 1896. 15c. allowed for each copy in exchange. Address THE FERN BULLETIN.

HEPATICÆ WANTED—The undersigned desires specimens of all species of Hepaticæ. State species and price. W. C. Barbour, Sayre, Pa.

WANTED—To exchange sets of from 20 to 30 specimens of Eastern New York ferns, containing among others *Schizæa*, *Lygodium* and *Scolopendrium*, for an equal number from the Central, Southern or Western States. The Fern Bulletin, Binghamton, N. Y.

THE
FERN BULLETIN,

A Quarterly Devoted to Ferns.

EDITED BY WILLARD N. CLUTE

VOLUME VIII.

BINGHAMTON, N. Y.
THE FERN BULLETIN CO.
1900.

CONTENTS.

	PAGE.
A Fern Enemy— <i>Sadie F. Price</i>	86
A List of the Fernworts collected in Jamaica— <i>Willard N. Clute</i>	64, 89
A New Botrychium from Jamaica— <i>Lucien M. Underwood</i> ..	59
A New Dryopteris from Jamaica— <i>Willard N. Clute</i>	67
A New Variety of Isoetes— <i>A. A. Eaton</i>	60
Another Locality for <i>Schizæa</i> — <i>Mrs. Emily Hitchcock Terry</i> ..	36
A Second Fern Meeting— <i>W. R. M.</i>	48
Binding the Bulletin	88
Book News	23, 46, 70, 94
Connecticut Stations for <i>Asplenium montanum</i> — <i>C. B. Graves</i>	18
Daniel Cady Eaton— <i>William Albert Setchell</i>	49
Do Ophioglossums Rest for a Season— <i>Joseph Crawford</i> ...	17
Dryopteris (?)— <i>Charles T. Druery</i>	41
Dryopteris simulata in Pennsylvania— <i>C. F. Saunders</i>	14
Dryopteris vs. <i>Lastrea</i> — <i>Charles T. Druery</i>	87
Editorial	20, 44, 68, 92
Election of Officers— <i>W. R. M.</i>	96
Ferns of Southeastern Ohio— <i>Mrs. J. D. Taylor</i>	78
Grape Ferns of Mount Ararat— <i>C. F. Saunders</i>	82
Helps for the Beginner	56, 81
Isoetes Dodgei—A New Station— <i>T. Chalkley Palmer</i>	6
Isoetes Howellii and Isoetes Nuttalli— <i>A. A. Eaton</i>	32
John Goldie— <i>Willard N. Clute</i>	73
John Howard Redfield— <i>Thomas Meehan</i>	25
John Williamson— <i>Geo. E. Davenport</i>	1

Linnæan Fern Chapter	24, 47, 72, 96
Lycopodium inundatum— <i>Willard N. Clute</i>	85
Marsilia at Night— <i>C. F. Saunders</i>	52
Notes	22, 46, 69, 93
Notes on American Ferns— <i>William R. Maxon</i>	29, 58, 84
Our Miscellany	42, 91
Ophioglossums Resting— <i>Homer D. House</i>	40
Pellæa gracilis in Illinois— <i>E. J. Hill</i>	31
Pteris aquilina and its allies in North America— <i>Willard N. Clute</i>	37
Some Hitherto Unnoted Variations of Familiar Ferns— <i>B. D. Gilbert</i>	9
Some Washington Ferns— <i>J. B. Flett</i>	40
Southern Range of Equisetum palustre— <i>Frank E. McDonald</i>	34
The Growing Periods of Southern California Ferns— <i>S. B. Parish</i>	26
The Genus Equisetum in North America— <i>A. A. Eaton</i>	75
The Habitat of Lygodium— <i>C. F. Saunders</i>	33
The Polypodies	56
The Rue Spleenwort near New York— <i>Pauline Kaufman</i> ...	16
The Second Meeting of the Chapter	72
The Sensitive Fern.....	81
Two New Ferns from Jamaica— <i>B. D. Gilbert</i>	62
Two New Isoetes— <i>A. A. Eaton</i>	12
Two New Stations for Schizæa pusilla— <i>Willard N. Clute</i> ..	15
Why Dryopteris and not Lastrea?— <i>Lucien M. Underwood</i> .	52
Williamson's Fern Etchings	35
Woodsia alpina— <i>Willard W. Eggleston</i>	5





JOHN WILLIAMSON

THE FERN BULLETIN

VOL. VIII

JANUARY, 1900

No. 1

JOHN WILLIAMSON

BY GEO. E. DAVENPORT.

JOHN WILLIAMSON was born in Abernathy, Scotland, about the year 1838, and came to this country about 1866, settling soon after in Louisville, Kentucky, where he established himself in the business of woodcarving, to which he had served an apprenticeship in Glasgow. It is to be presumed that, necessarily, in connection with designing and carving in wood, he must have acquired at least some rudiments of that knowledge of drawing which later on he turned to such good account in his exquisite fern work, but he once told me that he had never received any regular instruction and was practically self-taught.

At the time his "Ferns of Kentucky" was published he was engaged in carrying on a brass foundry, under the title of John Williamson & Co., and perfecting himself in the knowledge of working metals, which enabled him subsequently to give to the world that wonderful combination of the practical and beautiful in household decorative art seen in the remarkable output of the Williamson Art Metal Works at the Southern Exhibition in 1883.

Here was the turning point in his career, which, up to this time, had been one long, hard struggle. But Williamson possessed wonderful perseverance and patience. A key to the strength of his character may be found in one of his letters to me at about this time, wherein he wrote: "I work hard; I have no use for a lazy man. If I fail in my efforts at first, I try again, and keep trying until I do succeed." A near friend thus wrote of him in an appreciative review of his life, written for the Cincinnati *Commercial Gazette* shortly after his death: "He worked hard in a foundry by day * * * and studied books in a little room over the foundry far into the night. He had a great deal of confidence in himself. I watched with an admiring awe the dual man, so hard-handed, working with his great apron on at his trade, reading, drawing, worshipping at the woodland shrine of beauty in those moments when the finer, fairer self came upper-

in the transfer, Williamson decided to have the illustrations for his "Fern Etchings" printed direct from his plates, and in the second edition, he having meanwhile acquired sufficient knowledge to enable him to do the work, they were printed by his own hands. A marked improvement in the character of the illustrations was at once apparent, and "Fern Etchings" became the finest interpretation of fern life extant.

M. P. Whipple, who was recognized as one of the best art critics of his time, told the writer that in all that constituted the true test of etching, fidelity to texture and lifelike expression, they were the finest work of the kind he had ever seen. Hamerton, himself a master of etching, wrote to Williamson a highly complimentary and appreciative letter, which the latter always prized as one of his greatest treasures. Dr. Gray and Prof. Eaton both recognized in the work of the new comer the expression of a true soul, and both extended to him a most cordial greeting that uplifted his aspirations into an atmosphere of desire for the accomplishment of still better work.

The first edition of "Fern Etchings" was issued at Louisville in 1879, the number of copies being limited on account of the expense. The edition was quickly exhausted, and a second one soon followed. During the interval between the two editions he had been able to add *Adiantum capillus veneris* to his list of illustrations, and he used it for a frontispiece.* Encouraged by the unexpected favor with which his work was being received, Williamson's active mind began to consider other forms of expression for his remarkable genius, and being by this time well versed in the working of metals, began experimenting with etching on brass, with the most astonishing results. Wild flowers and ferns were the source from which he derived material for his exquisite designs, and his etchings on brass panels are the daintiest things imaginable. Fortunate indeed are those who now own the few plaques which emanated from his hand, for they may well be regarded as great treasures. He caught, as by some divine gift or inspiration, the innermost life and feelings of the wild flowers and ferns, and his marvelously accurate needle transfixed them with revivifying power on paper, or metal.

*In the *Bulletin of the Torrey Botanical Club* for September, 1883, may be found a glowing account of his visit to the newly discovered haunt of this fern, where he found it growing in the greatest profusion.

The story of John Williamson's life points a moral worth remembering. Let his appreciative friend again speak for him: "The manhood into which he carved his own life was even more marvelous than the handiwork which he has left to beautify the world. If I could make his life, now ended, reach even further; if I could, by the recital of his hardships and bravery, encourage some other one to battle earnestly against odds, I shall be grateful. He did his work well. He has left the world better for his having lived, and each of us can do as much."

WOODSIA ALPINA

BY WILLARD W. EGGLESTON.

THIS very rare fern was first found in the United States at Willoughby Mt., Vermont, by *C. G. Pringle in 1876.

Later he found it in Smuggler's Notch and Nebraska Notch, Mt. Mansfield, and on the north peak (chin) of Mansfield. Since then it has been collected in the Adirondacks. In June, 1894, Prof. F. A. Balch, then a student at Dartmouth, found what was called *Woodsia glabella* at Quechee Gulf, Vt. We saw a number of specimens of this collection in Prof. H. G. Jessup's herbarium and also some collected later by the Rev. J. A. Bates, all of which were *glabella*. This summer we have seen the plants in Balch's herbarium, and much to our surprise, most of them were excellent *alpina*.

Alpina, as we have known it both at Willoughby and Mansfield, is at great elevations. Probably the lowest elevation is at Willoughby, at about 2,500 feet. At Mansfield we have never seen it much below 3,000 feet, and it is found clear to the summit of the chin at 4,300 feet, in fact, the highest, most inaccessible cliffs, both at Willoughby and Mansfield, are the typical places to expect *alpina*. Who would look for it at a lower latitude and an elevation of 600 feet?

This shy fern, seen by so few of our botanists, has always been badly confused with *glabella*. Many of our good botanists collect both, thinking they have nothing but this species. *Alpina*, however, has a black or brownish rachis, with scattering paleaceous hairs, while that of *glabella* is entirely smooth and green.

*See C. G. Pringle's "Botanical Rambles in Vermont," Bull. Torr. Bot. Club, July, 1897.

Alpina also has a larger, coarser appearance in the field. To-day nine-tenths of the collectors will get *glabella* and never find *alpina*; this is partially owing to the scarcity and more inaccessible localities in which the latter grows, but more largely to the fact that the eye has to be trained to distinguish them in the field, although after once seeing them one can recognize them at a long distance. We are more often deceived now by smooth forms of *Ilvensis* than by *glabella*, in fact some smooth forms of *Ilvensis* require an expert to separate from *alpina*. In eleven trips to Smuggler's Notch we have seen the latter but three times; it was a red letter day for Dr. A. J. Grout and myself on Aug. 25th, 1893, when we found both this species and *Dryopteris fragrans*, after searching for them several times.

Again in 1897 we saw it, but the most successful trip for it was this season with Prof. Balch. First we found it on Mansfield Nose at about 4,000; then very fine specimens in the high cliffs of Pringle's Ravine, Smuggler's Notch. Much of our success in ferns and other "Notch" plants has been due to the counsel of C. G. Pringle, who, by the way, was in Smuggler's Notch this July for the first time in sixteen years.

Rutland, Vt.

ISOETES DODGEI—A NEW STATION

BY T. CHALKLEY PALMER.

THE writer has to thank Mr. Joseph Crawford, of Philadelphia, for an opportunity to study certain *Isoetes* material to which that gentleman's attention had been called by Dr. G. N. Best, of Rosemont, N. J., during a botanical expedition on July 4th of the present year. The plants were collected at Point Pleasant, Pa., on the Delaware. A hasty examination might lead one to call them *I. riparia*, but a careful study shows them to be *I. Dodgei* A. A. Eaton. To find this species cropping up so far away from its original and hitherto almost unique station seemed of great interest. After some correspondence, Dr. Best was kind enough to forward more of the plants in a living condition, and a comparison of aspect and habit of growth could then be made between them and the living material with which the writer was favored by Mr. Eaton in 1897 and 1898.

The East Kingston plants and these are identical in diagnostic characters, but differ somewhat in aspect. Those from Point Pleasant have smaller trunks and straighter leaves. They are

less rich in spores. They are, in short, less fat and flourishing than Mr. Eaton's prosperous plants from New England. It is the same sort of difference as that found in *I. saccharata* from Wicomico river and the same species from the head of Chesapeake bay. No doubt such variation is to be charged to environment.*

Dr. Best has kindly answered numerous questions as to plants and habitat. He first collected the species at Point Pleasant about ten years ago, and has not seen it elsewhere. He has frequently pointed it out to visiting botanists. The locality is far above tide, and is a broad, gently sloping river-bed, "made up chiefly of cobblestones and coarse sand or gravel." This bed is lightly covered with mud, and is "wet, but not submerged except in time of flood." The *Isoetes* has almost no other plants for company, and is exposed to the full glare of the sun. It often grows in the edge of the water, but sometimes farther back toward the bank, for even here every now and again it will be submerged for a little while at a time. It will be noticed that this habitat resembles in a manner the East Kingston mud flat, where Mr. Eaton first gathered and recognized the species, and that it is altogether unlike the tidal banks beloved of *I. riparia* and *I. saccharata*.

MICROSPORES.

The microspores, alike in Mr. Eaton's plants and in those of Dr. Best, are distinctive. The former gentleman has (FERN BULLETIN 6:6) described them, and has pointed out their great variation in size. Students of this genus will have a mental picture of the ordinary *Isoetes* microspore. It is, as a rule, in the form of a gentle crescent with very shortly frustrate and rounded ends, and with a central inflation on the concave side. Now this is the shape of possibly the majority of those of *I. Dodgei*. But intermingled with these, even in the same sporangium, are numerous larger ones, nearly or quite spherical, and sometimes twice the usual size. Their significance, and their development into cells containing spermatozoids, would be no bad subject for investigation. As to their origin, Mr. Eaton, in a recent letter, states his view to the effect that they are an overgrowth of "one of the four spores normally present in each mother cell, the other

* "When growing gregariously the leaves of *I. Dodgei* are more drawn out and straight, the trunks always small. Well developed plants with characteristic twisted leaves are only found where there is plenty of room, when even the submerged leaves are tortuous."—Eaton.

three being aborted." Similar abnormalities, he finds among the macrospores of this and other species, are explainable on this hypothesis. This is ingenious, and it may easily be sound as well.

Having in mind the discovery of Mr. Raynal Dodge (*Botanical Gazette*, XXII., 36 *et seq.*) that the highly sculptured macrospore envelope is composed largely of silica, and longing for some method of improving the execrable microscopical definition of the microspore, the writer has made experiments that show the latter also to be enclosed in silica. So much having been ascertained, a technique leading to clear definition becomes obvious. One simply dusts the microspores upon a cover-glass, heats this on a piece of metal to incipient redness until only a white powder remains, moistens with turpentine, warms gently and mounts in balsam. The spore-skeletons may now be examined with all kinds of illumination, and with the strongest objectives, even with oil-immersion if desired. Papillæ are thenceforth papillæ, tubercles are tubercles, spines are spines. One at last sees that which is present, and ceases from imagining the non-existent. The silicious envelopes retain their shapes and peculiarities, and the large, spherical microspores of *I. Dodgei* are in the same marked contrast with the small ones as before burning. Both kinds show a slightly wrinkled surface, the wrinkling being more evident around the edges. None of those examined have any papillæ. In this respect, as well as in size and shape, the microspores of this comparatively recent species may vary greatly.

It may be well enough to add that balsam mounts of microspores of *Isoetes* species in general show a faint sculpture over the surface which recalls, in a far-off way, the sculpture of the macrospores. In the silica wall of each spore there is also a long furrow or folded cleft—possibly a provision for the escape of the spermatozoids.

Media, Pa.

Does the climbing fern often grow in the open, as in the case of the Tennessee station which Mr. Ferris described in the last number of the BULLETIN? The only known station for the fern in the vicinity of Washington is an almost inaccessible cat-briar tangle bordering a low sphagnous swamp near the famous old duelling grounds at Bladensburg, Maryland. A little investigation and explanation of its habitat and habit might result in a further extension of range.—*William R. Maxon, Washington, D. C.*

SOME HITHERTO UNNOTED VARIATIONS OF FAMILIAR FERNS

BY B. D. GILBERT.

IT was a pleasure to see in the October number of the FERN BULLETIN so many observations arising out of the season's experience. This is the way to enlarge our knowledge of the ferns and to find out whether there are not still some unnoticed species or varieties among them. Let me mention a few of my own observations during the past summer.

There lies before me, as I write, a fine frond of *Dryopteris Goldiana*, three and one-half feet long and nine inches wide. It is normal in every respect except one. It bears twenty-two large pinnæ, and seventeen of these are *proliferous* near the tips. These pinnæ, instead of ending in the natural way, are either terminated with a pinnule as large as those in the middle of the pinna, or end abruptly with a pinnule on each side. At the base of this or these pinnules there are one or two buds on the costa, from which spring little rosettes of pinnules, so that they have the appearance of being tufted. It is a very pretty variation, and I have looked through all my botanies for some mention of it, but without success. I know the locality from which it came and shall search for it again next season. If it proves to be permanent, it is deserving of the varietal name of *prolifera*.

During the past summer I was led to pay some attention to *Asplenium acrostichoides* Sw. If you refer to the "Synopsis Filicum" of Swartz (edition of 1806), you will find at the head of page 82 a description of his own species *acrostichoides*, and next below it that of Michaux' species *thelypteroides*. Evidently Swartz considered these as two different species. On examining the descriptions it will be found that, while they are worded somewhat differently, they mean about the same thing until they come to the sori. Of *acrostichoides* Swartz says *soris transversis confertis*, while *thelypteroides* has *soris brevissimis parallelis*. This led me to observe the two; and I am satisfied that there are two quite distinct forms, sufficiently so to make a good variety. *A. acrostichoides* has broad pinnæ and pinnules, with long, rather wide-spread sori, which, on the lower pinnæ, often have the distinct athyroid character, folding across the veinlet and extending part way down the other side. The bend is so sharp that some times the sorus and indusium are broken and separated at the

turn, leaving what looks like a diplazoid or double sorus, with two parts lying back to back. In *thelypteroides*, on the contrary, the pinnæ and pinnules are narrow and the sori straight, parallel and set close together, so close that there is no room to cross the veinlet and run down the other side, although toward the tips of the pinnæ the sori are often double, or diplazoid.

My arrangement of these would be as follows: *Asplenium acrostichoides* Sw. Pinnæ and pinnules broad, sori on lower pinnæ often athyrioid. *Asplenium acrostichoides thelypteroides* Michx. Pinnæ and pinnules narrow, sori straight, parallel, set closely together.

If collectors who have the two forms in their herbaria will compare them together, they will find the difference quite striking, enough so, it seems to me, to form a valid variety.

Swartz gives the range of *acrostichoides* as North America in general; but he confines *thelypteroides* to the mountains of Virginia and North Carolina, which is probably the range given by Michaux. According to my own observation, *A. a. thelypteroides* is much more common in central New York than *A. acrostichoides*, which may be called rather scarce than otherwise. I should be glad to hear of the comparative range of the two from other parts of the north.

In connection with a fern which I gathered last fall, I want to say a few words about *Dryopteris dilatata*. Babington, Sowerby, Smith, Moore, Hoffmann, Presl, DeCandolle, and most of the older botanists, regarded this as a distinct species. But all of them, whether they considered it a species or a variety, characterized it as having an "indusium fringed with stalked glands." American botanists, however, from an early period, made the point that the indusium was "smooth and naked," and this has been insisted upon as an indispensable requisite of the variety in this country. But is it so? If it has indusia with stalked glands in Europe, why may it not have them in this country also? It seems to me that the distinction is false, and cannot be regarded as imperative. The mere fact that much of the *dilatata* found here has a naked indusium does not preclude the possibility of a form that may agree with the English form. The fronds of which I have already spoken have indusia with stalked glands; hence they cannot be *spinulosa* proper. On the other hand, their general form and cutting are quite unlike the var. *intermedia*, while they are very like the English form of *Lastræa dilatata glandu-*

losa, so beautifully figured by Moore in his "Nature Printed Ferns." Let me transcribe a few sentences from Moore's description. Fronds "bipinnate above, tripinnate below; longest pinnæ nearly six inches long and about two inches wide just above the base; posterior pinnules on lower pinnæ largest, one and three-fourths inches long; stipes one-third to one-half the entire length and clothed sparingly with ovate, bluntish or lanceolate-pointed scales, which are generally pale brown, scarcely tawny. Fructification is copious over whole frond and forms two lines on each of the smaller pinnules or on the lobes of the larger ones; and the sori are covered by indusia which are fringed with stalked marginal glands." These are the chief points, except that the rachis and under surface are also covered with glands when the fronds are young. These do not appear in our mature specimens. In a general way, the description fully agrees with the ferns I have gathered, and Mr. Clute sent me a frond of the same from some place in Connecticut, except that it is rather smaller. My fronds are three feet long and nine inches wide. Without taking note of minute details, I should say that this was a good form of *dilatata*. It is broad at base, and has the prolonged posterior lower pinnules of that variety, but is larger, and longer than, and not so nearly deltoid in shape as the common Rocky mountain form. It certainly does not agree with either *spinulosa* or *intermedia*, unless it should be claimed that the glandular indusium ought to rank it with the latter, irrespective of other characters. But if so, then how can our smooth involucred form be ranked under the same name as the form with glandular indusia found abroad? The fact is that such a distinction is too trivial to offset broader and more general characteristics. Perhaps it might be advisable, in order to give this a local habitation and a name, pending the revision of this whole section of *Dryopteris* which must be made some day, to style this form *Dryopteris spinulosa glandulosa*, as I have no doubt it is to be found in many parts of the country.

Clayville, N. Y.

—Miss Gertrude E. Dane writes of finding several plants of *Onoclea sensibilis*, var. *obtusilobata*, at Pepperill, Mass., from which the sporangia disappeared as the fronds matured. She asks if any one has found this variety with fully developed spores.

—Mr. C. C. Kingman reports finding a large patch of *Marsilia quadrifolia* on the Concord river, near Billerica, Mass.

TWO NEW ISOETES

BY A. A. EATON.

SINCE the time of Engelmann there has accumulated in different herbaria a large amount of *Isoetes* material which has not been properly segregated. Through the kindness of Prof. J. Macoun, of Ottawa, I received a long time since a lot of interesting specimens collected in various places on the west coast of America. Two at least of these are new; the one under consideration at present being collected by Prof. J. M. Macoun, of the British Behring Sea Commission, on the side of an extinct volcano on the island of Atka, near the western limit of the Aleutian chain.

It was entirely submersed in pools fed by springs, which apparently are never low enough for any of the plants to become emersed. Their appearance bears out this observation. The round leaves, few stomata, large cells and broad dissepiments, as well as absence of bast-bundles, place it among the submersed species. It is described as follows:

ISOETES MACOUNII, n. sp. Species small, submersed, with aspect of *lacustris*. Trunk flat or slightly bilobed, .5-1 cm. broad. Leaves, 5-12; 2-4.5 cm. long, very stout, 1-1.5 mm. wide, acuminate, sparingly stomatose near the tip, reddish green. Dissepiments 5-6 cells wide, and walls of leaves 3-4. Bast-bundles absent. Base of leaves widely winged. Ligula triangular-lanceolate. Sporangium orbicular, 2.5-3 mm. in diameter, $\frac{1}{4}$ - $\frac{3}{4}$ indusiate, thickly pale spotted. Macrospores 300-570 μ , average 450 μ , loosely beset with very stout, short, blunt or confluent retuse spinules, those below shading off to small papillæ next the equator, while those above grow on the commissures. Microspores averaging 35x27.4 μ , sometimes reaching 40 or 44 μ , finely and densely papillose, or rarely blunt tuberculate, elliptical. Habitat, pools on an extinct volcano, apparently never out of water, Atka, I.; 52° N., 175° W., August 26, 1891. J. M. Macoun, collector.

A few of the microspores are densely covered with small tubercles or papillæ, and are even cristate. As the plants are rather under-ripe, this may be the full-developed form. The leaves have peculiar organs situated under the epidermis, which might easily be mistaken for stomata. They are large, broadly elliptical, with indurate edge and granular interior. In the many American and European plants examined I have found them else-

where only in *I. papercula* from the Sierra Nevadas, and specimens of an undescribed species collected by Pringle in northern Maine.

I. ORCUTTI. Plant terrestrial, submersed only during the growing season. Trunk slightly trilobed, 4-6cm. long by 3-5cm. high, globose; leaves 6-15, 4-7cm. long, 6-7mm. broad, triangular, grooved above, slightly winged at base, with two (ventral and dorsal) weak bast-bundles, rarely with lateral ones also; stomata none (?); sheaths fuscous, narrowly winged; velum entire; ligula lunate or semi-circular. Macrospores very small, 240-320 μ in diameter, dark fuscous when wet, cinereous or glaucous when dry, brightly polished, without crests, but the surface finely pitted as if with pin-punctures, and often sparsely covered with a fine, mealy-white dust. Microspores dark brown, 22-35 μ long, averaging 26 μ long by 17 μ wide, spinulose. Growing on mesas at San Diego, Cal., sent by C. R. Orcutt. Found only in "wet" seasons, when there is sufficient rain to fill the low depressions on top of the mesas, in which it grows. As there are often several dry seasons in succession, it must have the power of lying dormant indefinitely, if, as may well be the case, it does not make a small growth in winter even when not submersed. It is not unique in this respect, however, as well-ripened specimens of *Eatoni* and *Boottii* have been found to retain sufficient vitality to grow after being dried and kept in the herbarium six months and more, while Motelay (Mon. Isoetes) states that *Engelmanni* has been raised at the Botanic Gardens of Bordeaux from spores taken from herbarium specimens.

A few of its anatomical characters may not be without interest to students of the genus. The rigidity of the leaf is not owing to the bast-bundles, which are small, but to the epidermal cells, which are large (13-17 μ), with a very thick outer wall 4.4 μ). As with all terrestrial species, the leaf cavities are very small and the dissepiments correspondingly thick, from 9-12 cells on the vertical to 6 on the transverse. Occasionally a bast-bundle is absent and its place occupied by another layer of epidermal cells. I have been unable to find stomata, but from the character of the plant I think they are present, at times at least. The leaves are very small and difficult to manipulate, owing to the thick dissepiments and walls, which must all be removed after splitting the leaf, by scraping, before the stomata could be seen. The terrestrial species heretofore found all have stomata, though less than the amphibious.

This is the only North American species with ashy spores, though one black or dark brown-spored species, *Melanospora*, is found. Colored spores are found on several widely separated species. Tasmania gives *Gunnii*, *Stuarti* and *Hookeri* with glaucous or ashy spores; Australia gives *Muelleri* with ashy and *tripus* with fuscous spores. From South America we have *Gardneriana*, with blackish spores, and from Central Africa *Nigrilana* and *Welwitschii*, with glaucous spores. Several other species have spores that are not chalk-white, the usual color. In all cases the color seems to be a pigment secreted in the spore itself, the enveloping silica having the usual white color, and all elevations have a chalky whiteness. When the deposit of silica is thin the spores are dark brown, and ashy when it is thicker.

Seabrook, N. H.

DRYOPTERIS SIMULATA IN PENNSYLVANIA

BY C. F. SAUNDERS.

THE stations for *Dryopteris simulata* in Pennsylvania, so far as known to the present writer, are not many, and all are in the eastern part of the State. Dr. Thomas C. Porter has recorded it from the neighborhood of Pottsville, in Schuylkill county, as also from a swamp near Tannersville, Monroe county, and the herbarium of the Philadelphia Botanical Club is said to contain specimens from Paoli, Chester county.

In July last another station was added to this list when, in company with Stewardson Brown, of the Philadelphia Academy of Natural Sciences, I had my first sight of this fern in its wild home, growing in great abundance in the muck and twilight of a swampy spruce wood six miles west of Dingman's Ferry, Pike county. At that season the fruit dots were just appearing, and the fronds that bore them were in some instances not fully unrolled. In the same locality grew the marsh shield fern (*Dryopteris Thelypteris*), the crested shield fern (*D. cristata*), the spinulose shield fern (*D. spinulosa intermedia*), Boott's shield fern (*D. Boottii*), the royal fern (*Osmunda regalis*), and the cinnamon fern (*O. cinnamomea*). It was strikingly different in general aspect from *D. Thelypteris*, for which it is often mistaken. Some plants of the latter grow side by side with it in the swamp above mentioned, making comparison easy. Especially we noticed

the fronds of *D. simulata* had a peculiar shiny look, almost as though varnished, which I have never observed as characteristic of *D. Thelypteris*. The fertile fronds of the former species rose singly here and there a foot or more above the level of the crowded masses of the sterile growth, the tips of the latter indeed reaching as a rule only to the lowest pinnæ of the spore-bearing fronds. The outline of the lower pinnæ in *D. simulata* is very graceful, swelling gradually from base to above the middle, where it is noticeably broadest, and then narrowing to a tapering tip.

Philadelphia.

TWO NEW STATIONS FOR SCHIZÆA PUSILLA

BY WILLARD N. CLUTE.

DURING the first week of last July, I had the pleasure of spending three days collecting in the pine barrens of Southern New Jersey with that enthusiastic botanist, Mr. C. F. Saunders. The region explored was that between Tuckerton and Atsion—one of the most sterile in the state. The only means of reaching the interior is by wagon over a sprawling road into which the wheels of passing vehicles sink for several inches, and along which three miles an hour is considered rapid traveling. Its prevailing characteristics are sand, sun and mosquitos, and as there are practically no inhabitants, and nothing is produced except huckleberries and cranberries, the region is seldom visited.

But barren as it may appear at first glance, it nevertheless contains many rare and interesting plants. Nestling among the sandy knolls are numerous boggy stretches possessing a comparatively rich flora that is not entirely lacking in undescribed species. As the drier parts of these bogs are similar to the localities in which the little curly grass (*Schizæa pusilla*) delights to dwell, we set out upon our trip with the expectation of finding it, and in this were not disappointed.

The first specimens were discovered by Mr. Saunders at Allen's Bridge, after sunset. The waning light prevented a thorough search, but the next morning we found an abundance of it on both sides of the western approach to the bridge. Many specimens were growing close to the wagon track. We have little hesitation in making the exact locality known, since it is separated from Tuckerton—and everywhere else—by sixteen miles of the sandiest road in New Jersey.

The spots favored by *Schizæa* are so characteristic that the practiced collector usually knows at a glance whether it is worth while searching for it in any given locality or not. Our second station—near Calico, about ten miles further west—was found in this way. It was some distance from the road, but looked like a *Schizæa* locality, and, going to it, specimens were found within five minutes. All the locations in which I have found it growing are very much alike. They may be described as open, sunny cedar swamps, where the undergrowth consists mainly of huckleberry bushes and cranberry vines, with a plentiful sprinkling of the round-leaved sundew (*Drosera rotundifolia*), the thread-leaved sundew (*D. filiformis*) and the three club-mosses, *Lycopodium Carolinianum*, *alopecuroides* and *Bigelovii*. In any place in southern New Jersey where all these grow, I should feel warranted in expecting *Schizæa*. Even there, however, it might have to be searched for on hands and knees.

At the time of our visit the fertile fronds of the year were very young, but we were pleased to observe last year's fertile fronds remaining on many plants, just as they do on the sensitive fern. The sterile fronds did not much resemble their pictures in the books. They are not twisted in various ways, but are really little coils or elongated spirals, which seem trying to lay hold on the surrounding vegetation, thus indicating their relationship to the climbing fern.

Without doubt there are many other places in the southern part of the state in which *Schizæa* grows, but like the ones mentioned above are too remote from the usual lines of travel to be very often visited. The best known stations for the plant—Tom's River, Forked River, Burlington, Atsion, Quaker Bridge and Little Egg Harbor—are in a sort of circle on the borders of the region we traversed, in themselves sufficient warrant for assuming that it occurs at many places between.

New York City.

THE RUE SPLEENWORT NEAR NEW YORK

IN Central Valley, N. Y., about fifty-one miles from Manhattan and fourteen from Newburg, there is a tract of land, part cultivated and part swamp. Here, last August, we found a number of limestone cliffs, of which three were almost devoid of vegetation, the only sign of plant life being an occasional tiny

growth in their clefts. This I recognized as a fern with which I had not even a bowing acquaintance. The pinules resembled, in miniature, those of the large, cultivated maiden-hair fern, but there the similarity ended, as neither the texture nor the sori were those of *Adiantum*. The specimens, which were so tightly wedged that they could only be dislodged with the point of a scissors, averaged from two to four inches in height, with smooth, evergreen, triangular fronds and confluent fruit dots. Upon nearer acquaintance my fern turned out to be *Asplenium rutamuraria*, whose existence was unknown to the local authorities.

Near these rocks was another cliff entirely covered with vegetation, the dainty Herb Robert being most in evidence. Three feet on one side of this the rock was carpeted with *Camptosorus rhizophyllus*, which one could almost see walking. I counted thirty distinct plants in a patch four by seven inches. At the foot of this same cliff we found the maiden hair spleenwort (*Asplenium Trichomanes*), while the maiden hair rioted everywhere.—*Pauline Kaufman, New York City.*

DO OPHIOGLOSSUMS REST FOR A SEASON?

THE failure of *Ophioglossum arenarium* to appear in anything like its usual quantity this season at its original location at Holly Beach, N. J., caused me to conclude that the genus takes a year of recuperation. There were not more than four plants in the colony when visited just one week later than that of its discovery, July 4th, 1897, and those were perfect, having both sterile and fertile fronds, and two of them were from the same bud on the rootstock, a characteristic of the species. No small sterile fronds were found at all.

All physical conditions, as far as could be ascertained, were about as they had been for several years. The colony had suffered its greatest devastation in 1897, but that had little or no effect on the plants the following year. In fact, I feel safe in saying that last year no one visited it but myself, when I removed but few of them. This failure to appear during the year I noticed in *O. vulgatum* in 1897, when I visited two well-known localities to make living comparisons, but failed to find trace in either of them. I would like to have the views of fern students and collectors.—*Joseph Crawford, Philadelphia.*

CONNECTICUT STATIONS FOR ASPLENIUM MONTANUM

BY C. B. GRAVES.

INASMUCH as this fern reaches its northeastern limit, so far as known, in Connecticut, a brief statement of its distribution in this State may be of interest.

It was first discovered at Lantern Hill in New London county, and that station still remains the easternmost. The fern was found there in April, 1882, by Messrs. Fuller and W. A. Setchell (now Professor of Botany in University of California), and in December of the same year independently by the writer. These collections were reported by Prof. D. C. Eaton in the *Bulletin of the Torrey Botanical Club* for March, 1883. Previous to that time this fern was not known east of the mountains of Pennsylvania. Lantern Hill lies on the western edge of the town of North Stonington and about ten miles from the shore of Fisher's Island Sound. It is a precipitous elevation of nearly pure quartz, 520 feet high, with wild and picturesque surroundings, of great interest geologically as well as botanically. The fern grows in considerable abundance at several points on the sides of the cliffs both of the main hill and the adjacent ones.

The second station was found by Mr. Gerald Waldo, and lies less than twenty miles northwest of the first in the southwest part of the town of Scotland, in Windham county. In October, 1889, I found an abundance of fine plants at the "Devil's Hopyard," a wild valley situated about twenty miles west of New London, in the east part of East Haddam, Middlesex county. The rock here is for the most part a mica schist, and holds the fern in the crevices of the shaded and often overhanging cliffs.

The fourth station was discovered by Dr. Alexander W. Evans of Yale University, who found *Asplenium montanum* growing on the cliffs bordering the Naugatuck river near "High Rock Grove," in the town of Beacon Falls, New Haven county. I am indebted to Dr. Evans for information regarding this locality and the second above mentioned, specimens from which are contained in the Eaton Herbarium.

Finally, this past season, I detected the fern at another point in New London county, finding a few plants on cliffs near Ayer's Gap, in the north part of the town of Franklin. Upon consulting the map it is seen that of the five stations mentioned, four

are situated in the southeastern part of the State, either in or close to the border of New London county, and can be included within a circle having a diameter of twenty-five miles.

It is possible that *Asplenium montanum* has been detected elsewhere in Connecticut, but so far as I am aware no other stations are known. As the State is more thoroughly explored it is more than probable that other localities for this fern will be discovered. Indeed it would not be surprising if it were found to grow also in the adjoining States of Massachusetts and Rhode Island, Lantern Hill being distant only six or seven miles from the Rhode Island line. *Asplenium montanum* is able to maintain itself on the dryest and most exposed cliffs, provided there are holes or crevices which afford it a holding place. In such situations it is much stunted and often very inconspicuous, the fronds sometimes fruiting when less than half an inch in length. It reaches its best development on moist, shaded or overhanging ledges.

"On dry knolls, usually in hilly pastures, among 'mouse-ear' (*Antennaria plantaginifolia*).\" So wrote Mr. W. W. Eggleston, quoting Pringle, in his directions as to where to hunt for *Botrichium simplex*. I had a look in May, but was unsuccessful. No further opportunity was had till June 12, when I was so fortunate as to find four good specimens. Three of these had shed their spores, but the other, being in shade of a small cedar, was a little under-ripe. Dodge's date—May 20—is too early, and June 10, the Vermont date, too late. Probably June 1 is right for this place. Though undoubtedly common in northern New Hampshire, it has never before been reported from the State, nor has it been found heretofore east of the Connecticut river, save in Maine.
—A. A. Eaton.

Who will give us a rule for distinguishing *Woodsia obtusa* and *Cystopteris fragilis* in September? Dodge says, "Usually disappearing in August." That, I think, depends upon location. Plenty and fresh in September in Vermont and Massachusetts, I think I can say of both. He also says *fragilis* is bi-pinnate. I can't so count it. The little *fragilis* on a dry stone wall three or four inches high with black sori does not resemble specimens from Mt. Mansfield, Vt., Hawaii and India so much as either one of them does my *Woodsia obtusa*.—James A. Bates, South Royalston, Mass. [Near the city of Washington in January last, the editor saw plenty of *Woodsia obtusa* with fronds fresh and green, which proves it to be evergreen in that latitude at least. How much farther north does this condition exist?—ED.]

EDITORIAL

THE BRYOLOGIST

After two years experience as a department of this journal, the *Bryologist* feels confident that it can go it alone, and this month begins its career as an independent publication. At the same time our connection with it ceases, the entire stock and good will having been sold to its editor, Dr. A. J. Grout, who, with Mrs. Annie Morrill Smith as associate, will continue its publication. The new owners are well equipped for making the *Bryologist* an attractive and successful journal, and have our best wishes for its continued prosperity. The space left vacant by the removal of the *Bryologist* will, in future, be devoted to ferns.

* *

A FERN PARADISE

In an early number of THE FERN BULLETIN, Mr. B. D. Gilbert alluded to the Island of Jamaica as "the fern-lover's paradise," and not without reason. Its peculiar topography makes it the richest of all the West Indies in ferns and fern allies. Nearly five hundred species are already known to grow there, and the chances of finding still others are by no means rare, since many parts are yet little explored, botanically. The editor of this journal has resigned his position at the New York Botanical Garden and expects to devote the next few months to collecting both flowering plants and ferns in this region. Sets of these will be for sale at the usual rates. All correspondence regarding them, as well as letters to the editor, should now be addressed to Binghamton, N. Y.

* *

MASSACHU- SETTS SHIELD- FERN

There is a tendency among thoughtless persons to apply the name of Massachusetts shield fern to that last discovered of our Dryopterids—*simulata*. The sole reason for this seems to be that a gentleman from Massachusetts named the species. Although it does not seem to be generally known, the fern was first found in New Hampshire. Ever since its discovery new stations for it have multiplied until it is known to range from Maine to Virginia and the Indian Territory, and may yet prove to be common in all the northern States. There is at least some slight excuse for calling a fern for a State when such a common name is a translation of the specific one; but Massachusetts shield-fern has not this excuse for existing and should be dropped from our lists, or rather refused a place upon them.

CHAPTER AND BULLETIN It has been a long time since the Fern Chapter and THE FERN BULLETIN were under the same management, but the relation between the two is still misunderstood by many. At this season, when the payment of the Chapter's annual dues begins, it should be remembered that this journal is sent free to all members of the Chapter whose dues are paid, but the dues should be sent to the Treasurer of the Chapter, and not to us.

* *

THE FERN PROTHALLIUM Among the remarkable features in the life of a fern, none are more wonderful than those which belong to its prothallium or "caterpillar" stage, as one author has expressed it. This filmy scale that bridges the fern's existence from spore to frond runs the gauntlet of many dangers and is able to pass in safety only because of its surprising adaptability. The normal prothallium rarely lives longer than a few months, but if its purpose is thwarted there seems to be no limit to its span of life. Instances are known in which prothallia have been kept thus for more than seven years and then possessed sufficient vitality to produce new plants. The archegonia are borne on the darker underside of the prothallium, but if this is exposed to the light, these organs will be borne on the upper surface also. If quartered, each section of the prothallium will strike root and grow almost as rapidly as if undivided, and if the sectioning has been done so that the archegonia and antheridia are on different pieces, the organs belonging to different species may be brought together and various hybrids produced. Investigations along these lines have been scarcely begun and further study may disclose more curious facts.

* *

SOME PECULIAR NOMENCLATURE In a recent publication we find what to many botanists will be a new use of terms to distinguish the type of a species from its forms or varieties. This consists in the repetition of the specific name. Thus, to indicate the true type of the Christmas fern, our author would write *Dryopteris acrostichoides acrostichoides*. But it is not until we examine its application in some such case as that of the homely and familiar sassafras, that the full possibilities of this principle becomes apparent. The sassafras, as most are aware, was named when there was apparently no extra names to spare, in consequence of which its generic,

specific and common names are monotonously alike. But for fear, with all these, that there might be a doubt as to the type, and wishing to add the common name for further guarantee, we would be justified by the new method in writing *Sassafras sassafras sassafras*. *Sassafras*. Those in favor of the method will argue that having three names alike already, another of the same kind will not matter, but we have a suspicion that it may be possible to get too much even of a good thing.

NOTES

—In the article entitled "Ferns Out of Place" in the October number, the types made us report the oak fern as *Phegopteris Phegopteris*. It should, of course, be *P. Dryopteris*.

—Writing of the "Habitat of the Pellæas" in the *Bulletin of the Torrey Botanical Club* for November, E. J. Hill notes the dislike of *P. atropurpurea* for any rocks except those that have undergone a long period of weathering. This fern is found on many ledges in Illinois, but shuns all quarries where the rock face is new. The fern's aversion to shade is also mentioned. It delights in dry, hot cliffs.

—Mr. William Palmer has published in the *Proceedings of the Biological Society of Washington*, under date of September 28, 1899, a paper on "The Ferns of the Dismal Swamp, Virginia." This is an annotated list of the sixteen species which the author has found growing there. A form of *Dryopteris Goldieana* is described as new and named *D. G. celsa*. A plate showing the difference between the species and sub-species is included in the publication.

—Mr. A. A. Heller, well and favorably known for his collections of, and publications upon, the plants of various parts of North America, has resigned his position at the New York Botanical Garden and will start this month upon his second collecting trip to Porto Rico. He will be gone several months and expects to bring back with him a very representative collection of the Porto Rican flora. Mr. Heller begins his work with probably a better knowledge of the flora of this island than is possessed by any other American, having spent the first half of last year collecting plants upon the Vanderbilt expedition for the New York Botanical Garden. He expects to have his sets ready for distribution before autumn. Special attention will be paid to the ferns and their allies, sets of which may be ordered through THE FERN BULLETIN.

—In an article entitled “Two Hitherto Confused Species of *Lycopodium*” in the *Bulletin of the Torrey Botanical Club* for November, F. E. Lloyd presents some additional evidence to prove that what has been regarded as the variety *Chamaecyparissus* of *Lycopodium complanatum* is entitled to specific rank. The principal points in which *Chamaecyparissus* differs from *complanatum* is shown to include the subterranean rootstock, the more erect branches producing annual growths at the end of the branchlets, the less flattened distal branches, and the ripening of spores a month or more in advance of the other. *L. Chamaecyparissus* has been regarded as distinct by many botanists, the first to note it being Alexander Braun, whose name now stands as the authority for the species.

BOOK NEWS

Upon examining the new book by Doctors Rusby and Jelliffe, on the “Morphology and Histology of Plants,”† one is at a loss which most to admire, its comprehensiveness or the style in which it is written. The book is issued in place of the authors' earlier volume, “Elements of Pharmacognosy,” but it is in reality a new work, being entirely revised and much new matter added, the latter principally chapters on collecting and pressing specimens, the dissecting and analysis of flowers, and kindred topics. The authors' success in their respective branches is sufficient guarantee that the book contains the proper matter for the embryo pharmacist, and we may therefore judge the book upon its usefulness to the general botanist. After a surfeit of books, beginning with the lower forms of plant life, it is refreshing to take up one which at once breaks into a consideration of the flower—the part of botany that is most attractive to all beginners. The chapters devoted to this part of the subject probably contain as complete and scientific account of the flower and its parts and the office each performs in the economy of the plant as it is possible to find. The discussion then proceeds to the seeds, roots, stems and leaves. Each paragraph is introduced by the title of the topic treated therein which will greatly facilitate reference to the work. Since powdered drugs for the most part engage the attention of the pharmacist, the section devoted to histology will

†“Morphology and Histology of Plants.” Part I.—“The Morphology of Plants,” by H. H. Rusby, M. D. Part II.—“Plant Histology,” by Smith Ely Jelliffe, M. D., Ph. D., New York; published by the authors, 1899. 8-vo., price \$3.00.

seem of most importance to him, but any student of microscopic botany will find this equally instructive and valuable. We note that the illustrations for this part are mostly taken from drug plants. The book is well printed, well bound and contains numerous illustrations.

The description of plants in language adapted to the needs of the ordinary reader is not uncommon, but Prof. Conway MacMillan is probably the first to attempt this treatment for an entire flora. "Minnesota Plant Life,"* therefore, is likely to receive more than a passing survey by botanists. The book begins with the algæ and following the arrangement of Engler and Prantl proceeds upward to the composites, giving a great amount of interesting and valuable data regarding the haunts and habits of the plant families of Minnesota. The language used can scarcely fail to make the book attractive to those non-botanical readers for whom it is intended, but it is a question whether its usefulness is not somewhat impaired by the omission of the scientific names. In his desire to avoid the use of too many technical terms, the author seems to have gone to the other extreme and used too few. Common names are altogether too unstable to be trusted to stand alone for the species. This, however, is the only fault we can find in the book. It is entertainingly written and much better printed than the usual State report. There are nearly five hundred illustrations, a large number from photographs. All in all, the book is the type of what we should like to see from other States. It is probable that botany would have a much larger following if such books were common.

*"Minnesota Plant Life." by Conway MacMillan Report of the Survey; Botanical Series III.; St. Paul. Minn., 1890. 8-vo, 568 pp.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—The October election resulted in the selection of the following officers for 1900: President, William R. Maxon; Vice-President, B. D. Gilbert; Secretary, Prof. W. Alphonso Murrill; Treasurer, James A. Graves. A full report of the election will be published in the annual report.—C.

—A revised list of members will be published in the annual report. All changes of address should be sent to the Treasurer at once.—C.

30 cts. per Year.
15 cts. per Copy.

Vol. VIII.

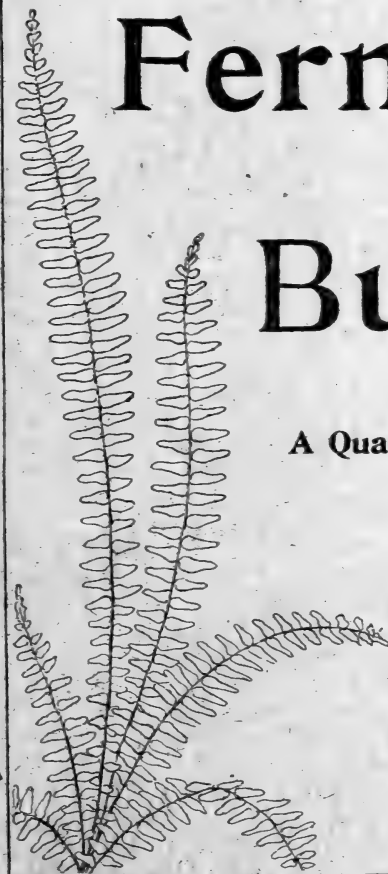
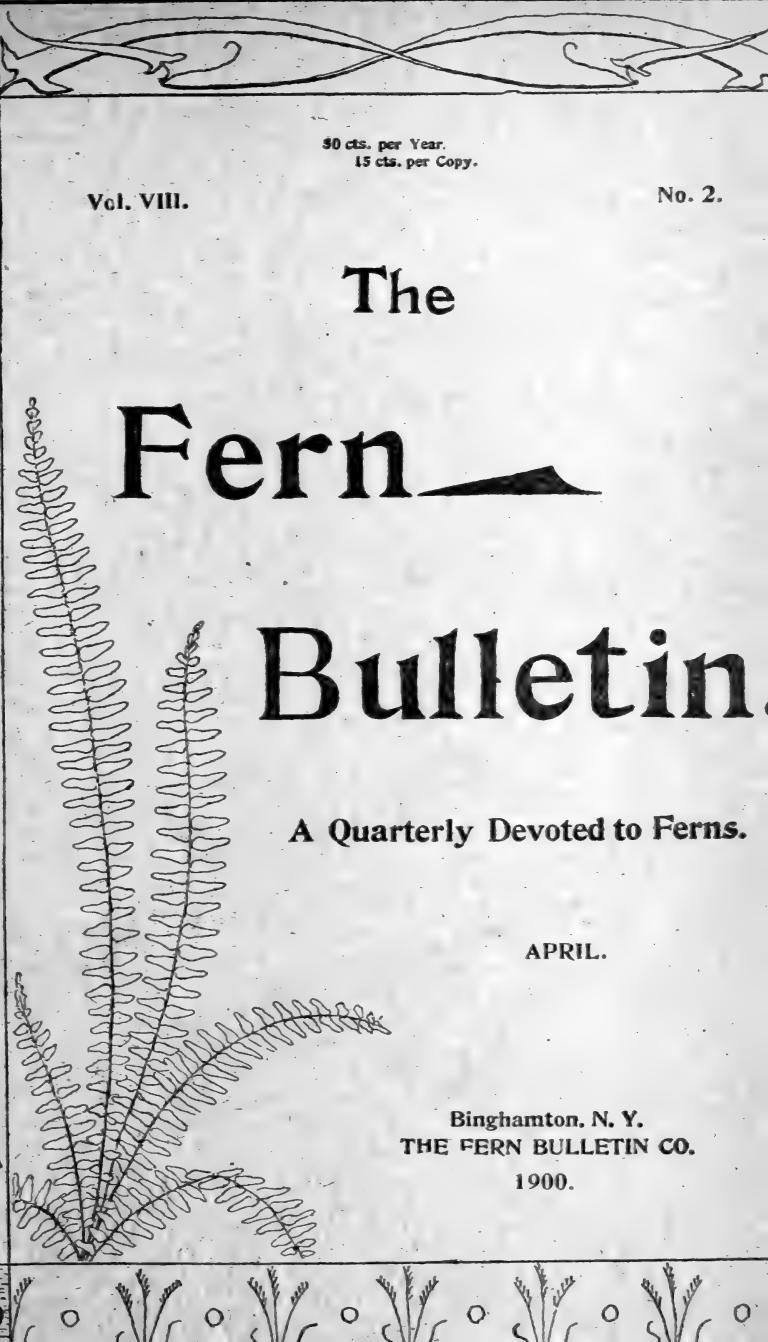
No. 2.

The Fern Bulletin

A Quarterly Devoted to Ferns.

APRIL.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1900.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

If this paragraph is marked, your subscription has expired. The mark indicates the time it expired as follows:

- x—With the previous volume.
- 1—With the present number.
- 2—With the January number.
- 3—With the April number.
- 4—With the July number.

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. Personal checks must contain ten cents extra for collection.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT, WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

CATALOGUE OF BOTANICAL BOOKS

Sent on Application.

Newman F. McGirr, DEALER IN BOOKS FOR THE
NATURALIST.

Box 2044, PHILADELPHIA, PA.

WANTS AND EXCHANGES.

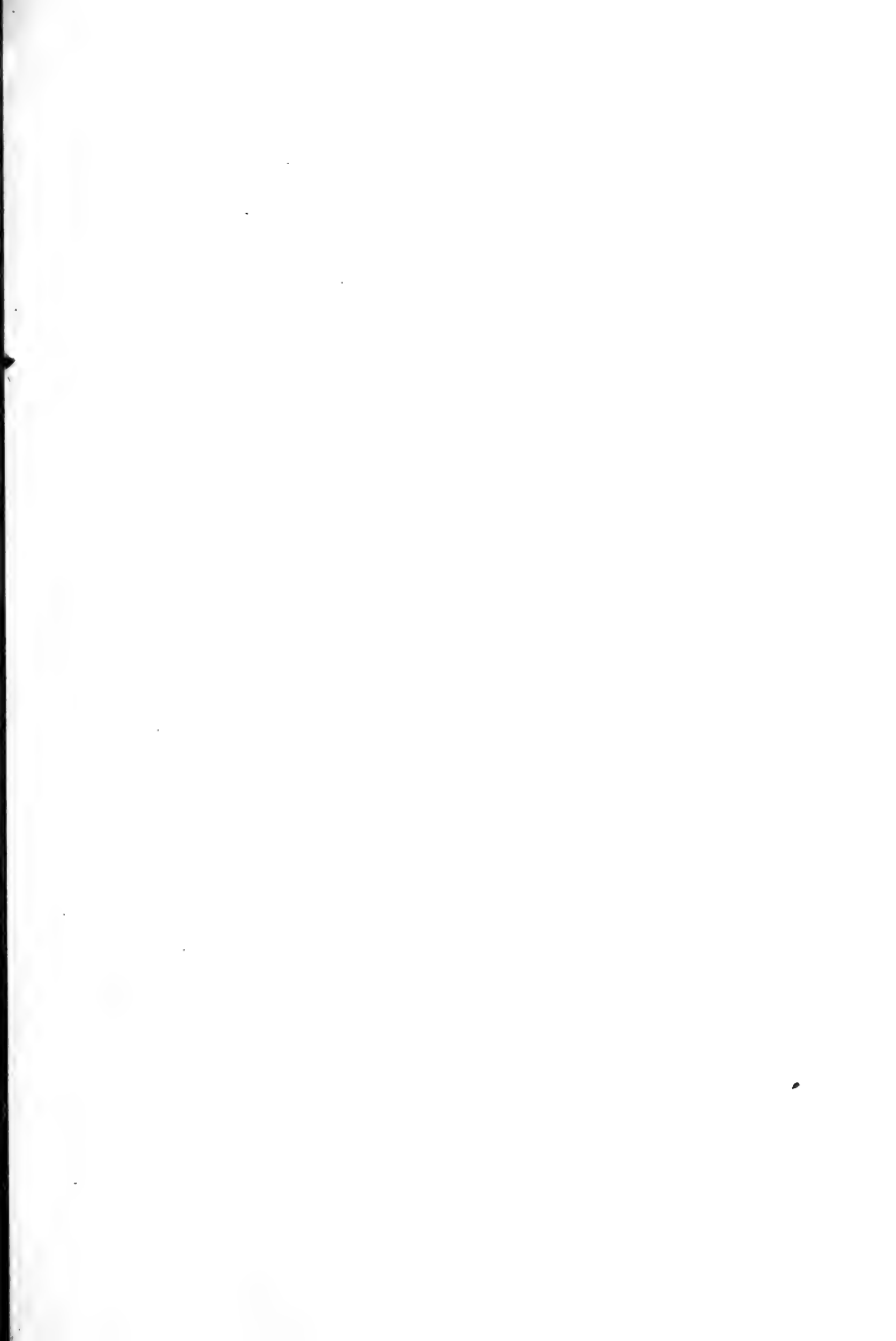
Special announcements inserted here, for One Cent a word. No notice received for less than 25c. No charge for address.

FOR SALE—"Ferns of Iowa and their Allies," a 14-page descriptive pamphlet of interest to fern lovers. Only a few copies left. Price 10 cents. Address, T. J. Fitzpatrick, Iowa City, Iowa.

WANTED—To exchange sets of from 20 to 30 specimens of Eastern New York ferns, containing among others *Schizaea*, *Lygodium* and *Scolopendrium*, for an equal number from the Central, Southern or Western States. The Fern Bulletin, Binghamton, N. Y.

WANTED—THE FERN BULLETIN files in the National Museum lack only the January, 1896, number. Who will sell me one for the Museum? Wm. R. Maxon, National Museum, Washington, N. Y.

FOR SALE—Eastman's 4 x 5 Kodak, will carry rolls of film from 12 to 250 exposures; good condition; used but a little; cost \$47.50, will sell for \$11 and include a carrying case. I. P. Blackman, Sandy Hook, Conn.





JOHN HOWARD REDFIELD

THE FERN BULLETIN

VOL. VIII

APRIL, 1900.

No. 2.

JOHN HOWARD REDFIELD.

BY PROF. THOMAS MEEHAN.

FEW deserve to be held in more grateful remembrance by pteridologists than John H. Redfield. The best workman is he who loves his task. Botany with our friend was wholly a labor of love, if indeed to him it was a labor at all. He was a business man, and scientific work his diversion from business tasks. Though the plants of all orders from any part of the world afforded him material for profitable study, ferns gave him the greatest pleasure. In the knowledge of ferns he was regarded as an authority. His fern herbarium was especially complete. This is now, with the rest of his botanical collections, a part of the great herbarium of the Missouri Botanical Garden, for which it was secured by Prof. Trelease after Mr. Redfield's death.

Though his advice and assistance in solving difficulties in connection with plants in general, and ferns in particular, were continually sought for, he published little. His chief works were the "Distribution of the Ferns of North America," published in the *Bulletin of the Torrey Club* for 1875; on "Insular Floras," in the same volume, and the "Flora of Mt. Desert and Adjacent Islands," prepared together with his friend Rand, and issued in 1894. He had set for his greatest task the building up and preservation of the great Herbarium of the Academy of Natural Sciences, of Philadelphia. He was the founder of the botanical section of the Academy, chiefly that he might be the authoritative conservator. By his will, his collections and books were sold to form the nucleus of a fund for its care for all time. With little more help than was given him by the three workingmen botanists, Messrs. Burk, Parker and Diffenbaugh, he succeeded in making the herbarium a famous one.

Mr. Redfield was born on July 10th, 1815, at Middletown, Connecticut. His father, W. C. Redfield, was a remarkable illustration of self-culture. They had few books made by hand

in their house, except Lindley's English Grammar, Milton's Paradise Lost, the Bible, and Cook's Voyages, but he studied closely the unwritten book of nature. While he was studying the forest devastation by tornadoes, resulting in his great discovery of the rotary motion of these destructive agents, the son was collecting and comparing plants, minerals, and other objects when in company with his parent. The father at last, interested in steam-boating on the Hudson, and thus getting to New York occasionally, bought books, among others Thornton's Grammar of Botany, and a Latin reader. The son taught himself the Latin language in this way, and had his botanical tastes fixed when but 10 years of age. The father subsequently moved his family to New York, and the son was placed in a high grade Lancasterian school. A Baptist clergyman, Rev. Samuel Barnes, the head of the school, was a devotee of natural history, and Mr. Redfield credits him with fixing his tastes in the scientific direction. He also always spoke in the highest admiration of the love for learning he derived from the parapatetic women who taught the country schools in the winter, and which led him to be a strong advocate through life of women teachers in even the highest positions in our public schools.

As a man he was universally beloved. He was in close friendship with the leaders of scientific thought and botanical eminence in many parts of the world. Hooker, Ball, Torrey, Gray, Sargent and other famous men were his intimate friends. He was never known to speak ill of any one. Charity to all was his working principle. His active work in the Academy of Natural sciences commenced in 1860, and continued till his death on the 27th of February, 1895. A genus of grasses, named by Prof. Scribner, *Redfieldia*, commemorates his deservings.

Philadelphia.

THE GROWING PERIODS OF THE SOUTHERN CALIFORNIAN FERNS.

BY S. B. PARISH.

THE physical peculiarities of Southern California are of such character as to give it two entirely distinct climates. The higher mountains are buried in snow in Winter, and the temperature sinks below zero. Consequently their climate is like that of the North, and plants grow in Summer and are dormant

in Winter by reason of the cold. At lower altitudes this is reversed. In Winter the air is mild, rains moisten the soil, and plants make their growth. In Summer the rains cease, months of heat and drought ensue, and plants perish or go into a dormant state for the want of moisture.

The ferns, like the other vegetation of the region, have become adapted in different ways to these various conditions. Most of them are rupestrine, and all are so in part. *Asplenium filix-femina* and *Woodwardia radicans* sometimes grow in mucky soil around springs, and *Adiantum emarginatum* on grassy banks, but even these more commonly prefer the addition of stones or rocks to the wet soil they require.

The ferns of the mountains are *Pteris aquilina* and its variety *lanuginosa*, *Cryptogramma achrostichoides*, *Pellaea Wrightiana compacta*, *Aspidium aculeatum scopulorum*, *Cystopteris fragilis* and *Woodsia Oregana*. Of these, the *Pellaea* is the only evergreen. All the rest die down to the roots in Winter, although the variety of *Aspidium aculeatum*, which is a very rare plant here, looks in Spring as if some of its fronds had survived the cold season.

The ferns which grow at low altitudes, have their periods of growth and rest regulated by the supply of moisture, and consequently those so situated as to have an unfailing supply are able to maintain a continuous growth. Such is the habit of *Woodwardia radicans*, which grows only where moisture is unfailing and notably along streams, and of *Adiantum capillus-veneris* which drapes the faces of shaded and dripping cliffs. *Aspidium munitum* and *A. rigidum argutum* are found on stony hill-slopes, in soil drier but still sufficiently moist to enable them to maintain the verdure of their fronds throughout the year, although they make their growth in the rainy months.

These are the only evergreen ferns of the lower altitudes, all the others vegetate in Winter and become dormant in Summer, thus just reversing the season of the mountain ferns. This is the most numerous class, and they preserve their vitality through the dry season in two different ways. *Adiantum emarginatum* and *Asplenium trichomanes incisum* lose their foliage, only the root persisting, thus adopting at a different season and for a different cause, the habit common to so many plants of cold countries.

But the most interesting and characteristic class have acquired an adaptation, which, by enabling them to utilize to the fullest

an uncertain and scanty water supply, permits them to flourish in situations far more arid than most ferns can endure. Those only which have this habit are able to exist in the desert region. They have their fronds protected against the heat and too rapid evaporation by a clothing of hairs or scales, or by a powder or a viscid secretion, only one, *Cheilanthes Californica*, being naked, and so needing a moister place than the others.

Their time of growth is the rainy season, and at its conclusion the fronds in place of dying, coil themselves into tight balls or looser bunches, the spore-bearing lower surface innermost. They are now dry and brittle, and if gathered, crumble into fragments. Apparently they are dead, but at the first rainfall they are softened, unroll, and take up again the interrupted functions of life. So long as the moisture lasts they continue to grow; when it fails they resume their dormant state, and this alternation of growth and rest may occur more than once in a season. There is a colony of *Notholana cretacea* on the exposed slope of a limestone hill so near me as to be conveniently visited. The crevices, in which the plants of this colony grow, are narrow and shallow so that they cannot long retain moisture. So in Winters of deficient precipitation, when the rainstorms are succeeded by intervals of drying winds *Notholana* changes from growth to rest, and back from rest to growth full half-a-dozen times in as many months, and one knows from the state of the atmosphere whether their fronds will be found expanded in growth or dry and thrust up like rows of little white or yellow fists.

The fronds of all these ferns retain their vitality until they mature their spores; they then die, and the withered ones long remain as a protective cluster around the living ones. Some of the earliest fronds may ripen their spores the first year in good seasons, but probably the most do not bring them to maturity till the second winter.

The ferns which possess this ability of suspending and renewing the active functions of life are *Gymnogramme triangularis*, *Notholana cretacea*, *N. Newberryi*, *N. Parryi*, *N. tenera*, *Cheilanthes Californica*, *C. Cooperæ*, *C. Clevelandii*, *C. fibrillosa*, *C. myriophylla*, *C. Parishii* and *C. viscida*. *Pellæa ornithopus* and *P. andromedæfolia* become dry and brittle, but do not coil up their fronds. Besides the Southern California ferns here mentioned this peculiar adaptation is common in ferns of other arid regions.

Polypodium Californicum yet remains to be noticed, a fern of greater altitudinal range than any other of our region, extending from sea level to at least 8,000 feet above it. A range so great implies exactly reversed seasonal conditions at the upper and lower extremes. Accordingly at the lower altitudes it vegetates in Winter, starting up as soon as the soil is moistened by the first rains, and as it has a good supply of nutriment stored up in its thickened rhizomes, its growth is rapid and luxuriant. At its upper limit, where it is a rare and diminutive plant, its growth is made in Summer and its rest taken in Winter.

San Bernardino, Cal.

NOTES ON AMERICAN FERNS: I.*

BY WILLIAM R. MAXON.

POLYSTICHUM SCOPULINUM (D. C. Eaton.) (*Aspidium aculeatum*, var. *scopulinum* D. C. Eaton. Fern N. Am., 2: 125, Pl. LXII, fig. 8. 1880.) Rhizome stout, ascending, roots cord-like; fronds variable in length, from 9 to 17 inches; stipe 2 to 5 inches, densely chaffy at the base with both broad and narrow bright-brown scales; lamina from 6 to 12 inches long, decidedly narrow lanceolate or even linear, 1½ to 2½ inches broad, sub-coriaceous, the chaff largely deciduous from the rachis; pinnæ numerous, 7 to 15 lines long, 4 to 8 lines broad at base, ovate, obtuse, the basal portion pinnately lobed, the apical half serrate with pointed or aculeate teeth; pinnæ usually much reduced below; sori near the midvein; indusium peltate, large, somewhat lobed and glabrous.

Although the proper disposition of the large number of forms now included under *Polystichum aculeatum* is indeed a perplexing question, it appears to me that the so-called variety *scopulinum*, described and figured by Professor Eaton, is clearly entitled to specific rank. Its author considered it to be hardly nearer *aculeatum* than to our North American form of *P. mohrioides*,† and in the light of the material accumulated since, it now appears to stand about midway. Three specimens of this species are contained in the Eaton Herbarium. Upon these, which, through the courtesy of Professor A. W. Evans I have examined, and upon the specimens in the Columbia and National Herbaria the

*Published by permission of the Secretary of the Smithsonian Inst'n.

†Eaton, Ferns N. Am., 2: 254. 1880.

above description is based. The earliest specimens (Eaton Herb.), first determined by Professor Eaton as *Aspidium lonchitis*, were collected on the Hayden Yellowstone Expedition, in the Upper Teton Cañon of Eastern Idaho, July 28th, 1872. The present known range extends from Washington to Eastern Idaho, south to Utah and Southern California. It has also been collected on "Mount Albert, Lower Canada," 26 July, 1881, by O. D. and J. A. Allen (Eaton Herb.), a notable extension of range, and comparable to that of *Pellaea densa*. The "Mount Albert" mentioned is in Gaspé county, Quebec.

AZOLLA CAROLINIANA Willd. IN CENTRAL NEW YORK. Regarding the occurrence of this small and easily overlooked fernwort in New York State, Torrey, in his Flora, writes: "In slowly flowing waters, island of New York; floating on the waters of Lake Ontario (Pursh); Braddock's Bay (Dr. Bradley)." I am now able to report it from the interior of the State. Mr. Henry Warne, of Kenwood, N. Y., collected it several years ago upon one of the slow creeks at the eastern end of Oneida Lake; and the National Herbarium has lately received specimens from the same locality taken from the surface of the stagnant waters of Black Creek, which drains into Oneida Lake near Sylvan. They were collected by Mr. H. D. House, of Oneida, N. Y., August 8th, 1899. The species may well be looked for at other points along the lake.

POLYSTICHUM MUNITUM IMBRICANS (D. C. Eaton). (*Aspidium munitum*, var. *imbricans* D. C. Eaton. Ferns N. Am., 1: 188, Pl. XXV, fig. 3. 1879). This variety is to be distinguished from the species by its smaller size, and by the crowded imbricated pinnae which have long cuspidate tips and are set much more obliquely to the rachis than in the type. It is extremely chaffy at the base of the stipes, the scales being narrowly acuminate-lanceolate, often 10 lines long, and mostly of a rich glossy chestnut color. The greater portion of the stipe, however, and the lamina are nearly naked, in this respect differing materially from the species, which is usually chaffy throughout. The fronds are mostly heavily fruited, with the sori crowded in dense sub-marginal lines.

Having recently observed some excellent specimens of this variety, collected in Washington by Mr. J. B. Flett, and noticing Professor Eaton's remark that "it looks like a plant grown in a hot and dry place," I have asked Mr. Flett to describe its habitat and habit. He writes as follows: "It grew on a steep moun-

tain side in the talus and seams of moss covered rocks in company with *Selaginella rupestris*, a very large form of *Cryptogramma acrostichoides*, *Cheilanthes gracillima* and *Pellaea densa*. A forest fire had several years before swept off what timber there was along the mountain, but I do not think that there had ever been much where the ferns grew. The soil would not permit it. The rock was trachyte, with a southwest exposure, —little or no shade, occasionally a bush of *Ceanothus velutinus* and a manzanita. It grew in radiate tufts, something like *D. munita*, only more erect—very distinctly so—and perhaps a little denser than the type. The leaves are as densely crowded when growing as they appear when pressed. There was no water to be seen anywhere."

In the particular case mentioned above the visitation of the fire may have been the cause of the fern's variance from what is regarded as typical *munitum*; but it seems hardly likely, inasmuch as the three companion ferns were flourishing under the same conditions. Moreover, the herbarium material is so ample as to admit of no doubt that this is a generally distributed and fairly common form. The National Herbarium alone contains eleven specimens which are sharply distinct from the type. I am strongly inclined to think that subsequent study will prove it to be a distinct species.

PELLÆA GRACILIS IN ILLINOIS.

By E. J. HILL.

HAVING found this fern in the valley of the Desplaines river, and once before, in 1874, in that of the Kankakee river, an account of the two stations will be of interest, since they are, as far as I am aware, the only ones recorded for Illinois. Both are quite far south for its range when the low altitude is considered, though it goes somewhat farther south at higher elevations. The latitude of Kankakee, near which it was found in one case, $41^{\circ} 10'$, and the altitude above the sea about 600 feet. That of Lemont, in the valley of the Desplaines, is $41^{\circ} 40'$, and the altitude about 650 feet. In both cases the ferns grew in damp, shaded ravines cut in the limestones by small streams. At Kankakee they were on shelves of the limestone in recesses where the layers of rock had been disintegrated along the line of contact by atmospheric agencies, so that hollows were left where an upper layer roofed over a cavity, on the floor of which the plants

were rooting in the thin soil. Some were quite far in and it was necessary to reach into the hollow space to get them. Those near Lemont were on the sides of rocks, growing in moss and earth that had lodged on the steep slopes or been formed by the decomposing rock and vegetable matter, making a soft and rather rich bed for the slender rootstocks. They were accompanied by a generous growth of *Cystopteris bulbifera* and a couple of Liverworts, *Asterella hemispherica* and *Marchantia polymorpha*, the two latter mostly on barer portions of the rock. All four plants were nicely fruiting on a second visit to the locality in June. At Lemont it was an exposure of the rocks to the southwest, at Kankakee to the southeast, so that they were in line with the direct rays of the sun for a large part of the day, but were shaded by the trees or by the opposite ledge.

Chicago.

ISOETES HOWELLII AND ISOETES NUTTALLI.

BY ALVAH A. EATON.

NO satisfactory description of this variable species has been printed, so great confusion prevails regarding it. Engelmann had only very immature material, hence his mistake in describing *nuda*. The velum is very variable, usually narrow in the outer, and wide in the inner leaves. The sporangia are usually thickly spotted, and even shining black over the whole front and back surfaces, and in both kinds of sporangia; again they are nearly unspotted. In immature plants the schlerenchyma cells though present are usually uncolored. The ligula also varies from very short to very long. I find all the foregoing characters among duplicate type material from The Dalles.

The bast-bundles vary, as in most amphibieæ, according to the condition of the plant. Usually four, they at times are reduced to one or two; and, on the other hand, there is occasionally an accessory one in front. The species bears several resemblances to *Engelmanni* in appearance, bast-bundles, method of growth, etc. It is truly amphibious, growing in shallow water and on muddy banks, ditches, etc., after the water has gone.

I have as yet seen no good *Underwoodi*, but Henderson's description fits this exactly. It appears to be abundantly scattered over northern California, Oregon, Washington and Idaho, most abundant in the Columbia River basin.

A technical description would read as follows: Trunk bilobed, medium-sized; leaves, 6-30, or sometimes 50, 5-20cm. long, with numerous stomata and 4 bast-bundles. Velum variable, usually very narrow in outer leaves, two-thirds indusiate in inner ones. Sporangia orbicular in outer, narrowly oblong on inner leaves, usually spotted, mostly densely so, and shining dark brown or black with the abundance of cells. Sheath fuscous brown, deeply grooved, thus appearing bilobed in cross-section. Ligule very variable, now short triangular, now 4mm. long. Macrospores about 300 in a full-sized sporangium, 480μ in diameter, covered rather sparingly with low, blunt, isolated or convolute confluent crests. Microspores $22-30\mu$, light brown, covered with low blunt tubercles or spines.

I. NUTTALLI (*I. Suksdorfii* Baker). In my study of this species I found that no collector met it after the discovery of *Suksdorfii*, from which it differed only in being bilobed. Suspecting an error in description, I wrote Prof. Trelease, who kindly had Mr. Thompson examine Engelmann's material, which proved to be trilobed, thus confirming my suspicions and reducing *Suksdorfii* to a synonym.

Seabrook, N. H.

THE HABITAT OF LYGODIUM.

YOUR correspondent's note in the January issue respecting the nature of the habitat of *Lygodium palmatum* prompts me to state that of the six or seven places in the New Jersey pines where I have collected the species, only one could be regarded as bordering on the inaccessible. That was a thicket of close set saplings, shrubs and cat-briars, but the fern was not abundant there. The most luxuriant growth of the climbing fern known to me, is on the steep bank of a creek flowing through rather open pine woods, where its fronds twist about the small shrubbery that fringes the water, or clamber up the bank, and may be gathered without a scratch. I have also collected it on clear but shady sphagnous ground along a wagon road which skirts a wood within a few hundred yards of a railroad station. Another locality, which left a pleasant picture in my memory, was a shaded sphagnum lowland in the pines, where the undergrowth consisted of numerous erect, sparingly branched undershrubs (what kind I do not now recall), about which the *Lygodium* plants twined like so many little hop vines about their poles.—C. F. Saunders, Philadelphia.

SOUTHERN RANGE OF EQUISETUM PALUSTRE.

BY FRANK E. McDONALD.

IN a recent number of *Rhodora* the above species is mentioned by C. B. Graves as growing on the Connecticut river a few miles from the shore of Long Island Sound. The writer adds: "A northern plant not hitherto reported, so far as I am aware, south of northern Maine and the Vermont shore of Lake Champlain." The plant grows in the vicinity of Peoria, which would extend its southern range some distance beyond the Connecticut station.

It was discovered here first, many years since, by Dr. Fred Brendel, to whom it is credited in "Patterson's Plants of Illinois." As far as I know, it is the only station in the state. It grows here under the following conditions: Across the Illinois river from Peoria, in Woodford county, the alluvial bottom lands extend back for nearly two miles, ending abruptly in a chain of prominent bluffs, probably the ancient banks of the river.

These hills are honeycombed with springs, whose waters as they reach the foot of the bluffs combine to form bogs, that possess a flora strikingly different from that of the hills above them or the alluvial bottom into which they finally merge. The water is very clear and cold, even in the warmest of weather. In these springs, where the shallow water runs over a sandy, gravelly bottom, our *Equisetum* finds a congenial home. It grows abundantly and luxuriantly. Frequently, in company of *Nasturtium officinale*, there is such a mat of vegetation as to hide the water completely.

The fertile plant is often strictly simple in growth, without a branch. When branches appear they are few in number and short. Not so with the sterile plant. It often attains a height of 3 feet, and is profusely branched with long flexuous branches. Intermixed with *E. palustre* is *E. limosum*, but it is a much rarer species. It seems strange that this species of northern range should be found in an isolated station down in the heart of the Mississippi Valley. But the presence of some other plants is equally strange, and emphasizes the northern character of the flora of these cold bogs. I would mention *Habenaria hyperborea*, *Mimulus Jamesii*, *Lobelia Kalmii*, *Salix myrtilloides* and *candida*, *Eriophorum gracile*, *Scleria verticillata* and *Berula angustifolia*.

WILLIAMSON'S "FERN ETCHINGS."

THE interest in John Williamson's work aroused by Mr. Davenport's article in the January FERN BULLETIN makes further information upon the subject very acceptable. Through the courtesy of Mr. Edward C. Jellett, we are able to publish herewith some extracts from a letter by Williamson dated Louisville, Ky., Feb. 20, 1879, in which he refers to his proposed book of fern etchings:

* * * "Since I wrote you I have thought seriously over my second edition, and have changed my plan, and I think you will be pleased with the idea. Instead of having another edition of 'Ferns of Kentucky,' I have concluded to get out a new work entirely, entitled 'Fern Etchings.' This will consist of etchings of all the ferns in Gray's Manual, including all those, of course, that have been found recently in this geographical range.

"I think I will have somewhere about 62 or 63. I will have no generic views. The plates will be the same size as 'Ferns of Kentucky' (because I may have to utilize them afterward). I will, of course, use the best plates I have, but all the poor ones I will do over. I will have no descriptions, only the scientific names and common names, printed on page opposite the illustration. This you see is just a collection of etchings, nicely bound, 10x12 inches, on Whatman's paper. The ornamentation on cover will be *Trichomanes radicans*, printed in gold. Now you see I am not running any risk whatever. If I only get 10 subscribers I can go on. I have no idea of getting many, but I think I will limit the list to 100. It must be first-class in the true sense of the term. I have made arrangements about my printing. Every plate will be what would be termed in art circles an *artist's proof*. I have kept it the same price I wrote before, \$10.00.

"I have been greatly encouraged in my work within these few days, by receiving a charming letter from Philip Gilbert Hamerton. I sent him a copy of 'Ferns of Kentucky,' as editor of the 'Portfolio,' London, and a few lines accompanying it. You know he is a botanist as well as an artist, and his opinion is certainly valuable.

"I will just quote a few lines from his letter (please excuse me): 'I have not had time to examine it botanically, being as usual very busy, but I have seen enough to convince me that it is conscientiously executed. * * * I think the illustrations

are excellent for their special purpose. The ferns are represented with much delicacy and truth.' And then he says: 'You would render a considerable service to the study of botany if you drew other plants besides ferns, in the same manner.' This last paragraph is hardly practical. The field is too wide. I have no doubt but what it will be done some day, because I do believe this is the only way to teach botany—at least to make it popular. I intend confining myself to ferns, and if I have my health, I have no doubt but what I will have an etching of every fern indigenous to North America.

"Let me hear from you at your leisure. I thank you for the catalogue, and especially for taking an interest in my work.

"Yours respectfully,

"JOHN WILLIAMSON."

ANOTHER LOCALITY FOR SCHIZÆA.

A SHORT time since, a friend who is botanically inclined, though she refuses to be called a botanist, wrote me of her great joy in accidentally finding the *Schizæa* growing in Lakewood, New Jersey, about a mile and a half from the village. I begged permission to quote a few sentences from her letter.

She says: "It was growing on a narrow, open stretch of bog, in patches of white sand. The bog lies quite near a ridge of higher ground, with sandy soil and pines. I was alone, and stooping on my knees to pick a very beautiful spray of blooming *Pyxie*, when suddenly there brushed against my hand, and flashed before my eyes, the blessed brown fronds. Yes, there I was, right in the midst of quite a generous colony of *Schizæa* with its brown, tiny heads among tufts of grasses, sedges, mosses, *Lycopodiums*, sundews and the *Pyxie*. Close by, on the side where the pine woods reached down to the bog, cranberry vines and *arbutus* crept close to the little fern; while on the other side, in the swamp, were ferns, and later on, *Pogonias* and *Calopogons*."

It is undoubtedly true that this little fern, which is almost invisible to the naked eye, may yet be found in many places by careful searching, or even by accident, as in the case I have quoted, but I imagine few of these fortunate discoverers will reveal the localities with much accuracy of detail. Such knowledge will be reserved for the few; *the very elect*.—*Emily Hitchcock Terry*.

PTERIS AQUILINA AND ITS ALLIES IN NORTH AMERICA.

BY WILLARD N. CLUTE.

THAT the name of *Pteris Aquilina* L. has long stood for a most composite species is a fact well known to students of ferns. Almost as soon as botany was established upon a scientific basis, various forms of the common Bracken were noted, and ever since it has been a matter of opinion as to whether they should be considered as one or several species. The principal reason for this difference of opinion seems due to the size of the plants which prevents representative herbarium specimens being made. It is most difficult to get a good specimen of this upon a single herbarium sheet, and collectors have therefore taken small fronds or pinnae of larger plants, in both cases failing to give an adequate idea of their shape, size and habit. But while the unsatisfactory herbarium material has only served to obscure the differences that exist between the forms, in the field they have been observed time and again, and it may be confidently asserted that few botanists would call all these forms one species could they see them growing together. After allowing for the differences due to soil, climate and latitude, the gulf is still too great between the smooth, triangular fern of Eastern America, the tall, woolly one of the Northwest and West and the slender, irregularly branching one of the tropics, to consider them one.

For my own satisfaction I recently attempted to segregate these forms, and found that they separated very naturally into three groups, each with a distinct geographical range. So pronounced was this, that it was generally only necessary to know the locality on the label to say what the species was, or to see the species to say in what region it was collected.

One hundred and fifty specimens of the American Bracken were examined, being those in the United States National Herbarium, the Herbarium of Columbia University, the Herbarium of the New York Botanical Garden, the Underwood Herbarium and my own collection. From a study of these, I would place the North American forms as follows:

PTERIS LANUGINOSA Bory. (*Pteris aquilina lanuginosa* (Bory) Hook. Fl. Bor. Am. 2: 196. 1840). This is the common form of the Northwest. It is principally characterized by the stout creeping rootstock, tall fronds and densely woolly under-surface. It appears also to be less inclined to the triangular than

Pteris aquilina, and also differs from it in the pinnules which are usually shorter, broader and closer, and in the frond which holds its bipinnate character nearer to the summit. Fifty-three sheets of this species were examined which shows its range to extend from our southern border into British America, and from the Rocky Mountains to the Pacific. Specimens from every State in this area as well as those traversed by the Rocky Mountains, have been seen. The same species appears to be found in various parts of South America and the Old World, although some refer the Old World specimens to another species. If we are to have a separate genus for the species of *Pteris* with "a double involucre" this would be called *Pteridium lanuginosum* (Bory).

PTERIS CAUDATA L. (*Pteris aquilina caudata* (L.) Hook. Sp. Fil. 2: 196. 1858. *Pteridium aquilinum caudatum* (L.) Kuhn). This is a species nearly confined to the tropics which extends into the warmer parts of the United States. It is characterized by its height, narrow pinnules and pinnate branching. Twelve feet is not an unusual height for this fern. The fronds rise from a creeping rootstock, on a stout stipe. At a foot or more above the earth, the first pair of pinnæ are given off. These are spreading, nearly horizontal but usually drooping at the tips. The next pair are almost exact duplicates of the first, but little smaller, and with the same drooping habit. These are often at right angles to the first pair. In none of the many specimens that I have seen, does the frond hint at the ternate form of *P. aquilina*. The pinnæ branch in every direction, gradually decreasing to the half-drooping summit. The frond is usually tripinnate, or with the pinnæ again pinnatifid. The tertiary pinnules or pinnæ, are from a half to one inch long, and from less than one to four lines wide, usually separated from each other by from one to four times their width. Terminal pinnule several times longer than the others. Frond gray green in color. The forty-nine sheets of this species which I have seen show it to be present in only California, Texas and Florida, the greatest number from the latter State. In Mexico and the West Indies it is abundant, and doubtless will be found to occur in most of the Gulf States near the coast. *Pteris esculenta* Forst. of the tropics seems a mere variety of this, being distinguished by the pinnules decurrent upon the mid-rib, at a sharp angle, giving it a peculiar zigzag appearance.

PTERIS AQUILINA L. This is the common form in Eastern America. It is the one described in all our text books, and may

be briefly characterized as a species with broad ternate fronds inclined to triangular in shape. It has rather broad pinnules which are separated by about half their width, usually. In the larger forms the lower pinnules are often cut to the mid-rib. The terminal pinnules are as long, or not much longer than the lateral ones. Its range is the most general of all, it being common in all the Eastern States and extending into the south and west. In the warmer parts of its range this species produces a curious variety which is no doubt often mistaken for true *caudata*. I would dispose of it thus:

PTERIS AQUILINA var. *pseudocaudata* n. var. Rootstock and stipe similar to the type. Frond a foot or more long, triangular, smooth or nearly so. Lowest pair of pinnæ the largest. Pinnæ pinnate, or the lower again pinnatifid, ending in a long, broad, acute, terminal pinnule, two to several times longer than the lateral ones and usually broader. Secondary upper pinnæ usually linear or oblong, acute or obtusish, one-half to two inches long, two to four lines wide, lobed at the base or not, often crenate margined throughout, sessile or slightly stipitate, usually the latter. Fruit as in the type. This variety is known to extend from Maryland to Texas and Florida and along the coast through New Jersey to Long Island. I have collected it repeatedly in the last two localities. It is abundant in the "pine barrens." This form has no doubt given rise to the reported instances of *caudata* being found in some of the Northeastern States. It may be distinguished from the latter by its triangular form, broader, longer, thinner pinnules. It seems at its best in warm sandy situations. The specimens upon which this variety is based were collected by myself at Babylon, Long Island, Sept. 8, 1898 (No. 339), and are in my own collection. Those who prefer *Pteridium* to *Pteris* will call this *Pteridium aquilinum pseudocaudatum*.

My thanks are due to Dr. L. M. Underwood and Mr. F. V. Coville, for the loan of specimens for this study.

In the mountainous region of Rutland County, Vermont *Pteris aquilina* is called Hog-brake because the roots are a favorite food for swine. Sometimes a portion of worthless land where *Pteris* abounds, is fenced in and there the swine do double duty, earn their own living and at the same time by tearing apart the roots, prepare the land for cultivation.—Mrs. Stephen Knowlton, Danville, Vt.

OPHIOGLOSSUMS RESTING.

THE query of Mr. Crawford, in the January BULLETIN, as to whether Ophioglossums rest for a season, recalls to my mind some of my experiences with *Ophioglossum vulgatum*, the facts of which may serve to confirm his observation.

During the Summer of '96 Mr. W. R. Maxon and myself discovered a patch of Adder's-tongues south of Oneida, N. Y. Here they grew in such abundance that many were trodden upon at every step. In the succeeding Summer of '97 I visited the spot several times, and though they were by no means as plentiful as during the former year, yet I had no difficulty in finding large numbers of them. In the Summer of '98 they were even more plentiful than ever, but during the past Summer I revisited the spot to obtain some new specimens and to my surprise could not find half a dozen perfect specimens, where a year before they could have been counted by the hundreds.

Whether this lapse of a season in the plant's abundant appearance is due to an inheritant characteristic of the plant, or from external causes, such as a season either too wet or too dry, or from the stinging of the young shoot by insects, has yet, I think, to be ascertained. It may be purely accidental, but it is worth while to discover whether it is or not.—*Homer D. House, Syracuse, N. Y.*

SOME WASHINGTON FERNS.

By J. B. FLETT.

THE common brake is very large and abundant here. It reaches away above one's head and in favored localities it is difficult to get through them. The rootstocks are very troublesome to the farmer when the land is new. Our variety is much larger than the eastern form. The next in abundance is *Dryopteris munita*. This also grows very large, especially in our "fir" forests. It may be collected in fruit almost any month of the year. *Lomaria spicant* grows in about the same habitat, but the fruiting fronds are hard to find after Christmas. These evergreen ferns together with *Berberis nervosa* and *B. aquifolium* and *Gaultheria Shallon* give the forests here a semi-tropical appearance. *Adiantum pedatum* grows very luxuriant and may be found in a flourishing condition where it is protected. *Woodwardia radicans*, though seen in only two limited localities, attains a height of seven feet by actual measurement.

Polypodium falcatum grows abundantly in our mossy woods on old logs and decaying vegetation. I have never seen it growing in soil. *P. vulgare* seems to be confined to high altitudes. I have never seen it around Puget Sound anywhere. This is found growing out of crevices in rocks in company with *Dryopteris lonchitis*, *Cheilanthes gracilima*, and a species of *Woodsia*. Occasionally *Cryptogramme acrostichoides* peers through from between the stones. I believe these five complete the fern flora of the summit of the Olympic Mountains, at least the region which I visited. *Phegopteris alpestris* is found in the Cascade Mountains in about the same altitude as the above and is doubtless found in the Olympics. *P. dryopteris* grows abundantly in sub-Alpine regions in mossy woods in both the Cascade and Olympic Mountains.

Tacoma, Wash.

DRYOPTERIS (?).

BY CHARLES T. DRUERY, F. L. S., M. V. H.,

President of the British Pteridological Society.

ON reading the January number, and especially the articles of Messrs. B. D. Gilbert and C. F. Saunders, I note with regret that by the adoption of the name of *Dryopteris* for the already over-synonymed genus of *Lastrea*, *Nephrodium* or *Aspidium*, results in the existing confusion being worse confounded. I note also that the term "shield ferns" is applied to this family, known here and formerly universally as buckler ferns to differentiate them from the "shield ferns," or *Polystichums*. *Aspidium* is the term adopted by Kew, under which head both shield and buckler ferns are, to my mind, inexcusably lumped, the *Polystichums* forming one of the most marked genera existing. *Nephrodium*, as indicative of the kidney-shaped indusium, is a good name, and I have nothing to say against it, although in this country the term *Lastrea* is applied in all popular works to the native buckler ferns. That even in the botanist's mind these three synonyms lead to confusion is evidenced by the fact that in one of our best standard works, "European Ferns," by Britton, the letter press and illustrations and references thereto conflict in many cases; all three names, *Aspidium*, *Nephrodium* and *Lastrea*, conspiring to puzzle the non-expert reader. Now we find on your side of the ocean a fourth conspirator, "*Dryopteris*," which at

the first reading of the articles threw me completely off the track, until the reference to habitats and other pointers enabled me to recognize what ferns were alluded to.

May I therefore suggest for the serious consideration of the Fern Chapter the adoption either of *Nephrodium* or *Lastrea*, and the recognition of the difference between them as buckler ferns and the *Polystichums* as shield ferns, coupled with the dropping altogether of the new introduction, "*Dryopteris*?" I say *new* introduction advisedly, because whatever the reason may be of its adoption, whether priority or patriotism, it is quite certain to appear as new in its application to the great majority of fern student, scientific or amateur.

11 Shaa Road, Acton, London, W.

[It must be admitted that Mr. Druery voices the sentiments of many students on this side in reference to *Dryopteris*. Those who have adopted the name have done so in the hope that this last was to be the final change, but present indications are that it is as unsatisfactory to a large number as any of the others. As to "shield fern," "buckler fern," etc., it seems principally a case of different words to express the same idea.—ED.]

OUR MISCELLANY.

I was pleased last Autumn, when transplanting some native ferns, to find elaborate preparation for the first genial days of Spring. *Osmunda Claytoniana* proved particularly well developed, its tiny fronds presenting as complete a study in circination as could be desired, while the mission of the furry cloak in which they were enveloped was at once apparent.—*Bessie L. Putnam*.

Mr. Gilbert's description of the abnormality in *Dryopteris Goldieana* so strongly recalls to my mind some insect's damages, that I would suggest a re-examination. The truncate pinnae with an occasional enlarged terminal one, and especially the "little rosettes of pinnules," are all characteristic of a damage originating in the circinate unrolled tips of fronds and subsequently developing as described, while the scales in such cases look peculiarly like bulbilloid ones. I am sure Mr. Gilbert will pardon the doubt his description engenders in my mind. *Lastrea Montana* here frequently presents this appearance, imitating *L. Montana truncata* to a nicety, though the wound is always visible under a lens as a brown speck.—*Chas. T. Druery*.

Miss Mary F. Williams writes that last year in Berkshire, Mass., she found a clump of *Cystopteris fragilis* with well defined crest at the end of each leaf. The position of the plants seemed to indicate that all had sprung from a common ancestor.

The City of New York can scarcely expect to boast of its native ferns, although these are not so few as one might be inclined to imagine. A few months since while passing through one of the wilder parts of Bronx Park, I found in a spot where a marshy meadow ends at the foot of a shaded rock outcrop, no less than fourteen species of ferns growing wild within a radius of a hundred feet. The list follows: *Adiantum pedatum*, *Polypodium vulgare*, *Pteris aquilina*, *Asplenium Filix-fœmina*, *Dicksonia pilosiuscula*, *Dryopteris Noveboracense*, *D. Thelypteris*, *D. acrostichoides*, *D. marginalis*, *Osmunda cinnamomea*, *O. regalis*, *O. Claytoniana*, *Onoclea sensibilis* and *Botrychium Virginianum*. In the same circle were plants of *Equisetum arvense* and *Selaginella apus*. It may well be doubted whether those sections which possess a richer fern flora, can claim a station presenting so many species in so small a circle.—*W. N. C.*

The wonders of spore production as well as reproduction are also great. Apart from the ingenious arrangement of the capsules and the power of exploding and throwing out the little spores far and wide, there is that of their immense numbers to which I think I have alluded in my former papers. Recently I took a large specimen of *Athyrium*, the backs of whose fronds were literally brown with sori, and after somewhat elaborate calculation of the number of fronds, number of pinnæ, number of pinnules, number of sori per pinnule, number of capsules per sori, and finally number of spores per capsule, I came out with a very mighty string of figures which read as eleven hundred millions. This identical fern had stood in my fernery for quite a dozen or fifteen years. Every season it has scattered such a harvest as this. This place is full of nooks where spores should thrive, and in many cases do thrive, and yet there rarely appears a chance plant of it. I sow, on the other hand, these spores under glass in a pan and get plants *ad libitum*. Query, *cui bono*, as regards the eleven hundred million. The tiny insect world would, I expect, laugh at such a query; for doubtless they provide food for populations far and away beyond our census.—*Charles T. Druery, in report of the British Pteridological Society.*

EDITORIAL.

HENCE THE DELAY

When this number should have been made up, the editor was persuing ferns in the mountains of Jamaica, too far away from a post-office to make it possible to issue on time. We trust our readers will excuse us for once. Jamaica is probably the richest island in the world as regards ferns, having one for every four flowering plants. After rather a surplus of adventures we succeeded in collecting more than half the number of species with many duplicates. The publication of a list of those collected, with notes, will be begun in the next number of this journal.

* * *

TWIN SPECIES?

There are not a few fern students who find the lines separating certain species too close for comfort. As an instance, the case of *Botrychium obliquum* and *B. dissectum* may be cited. While the discussion whether one is really a variety of the other is in progress we may hazard the suggestion that perhaps they may both be forms of the same species. This conception assumes that out of a thousand spores of either form, a part would be like the parent, and the rest be like the other form. Some such phenomenon as this is strongly suspicioned in the case of some violets and grasses and offers a chance for some investigating botanist to reap glory for himself by proving or disproving this theory. Unfortunately the difficulties in the way of settling the *Botrychium* matter are practically insurmountable. One of our best known fern students scoffs at the idea that the two ferns above mentioned could be two forms of the same thing, but such a theory has many parallels in fact in the animal world and we may be somewhat premature in denying that it occurs in the plant world as well.

* * *

COMMON NAMES

The common names of natural objects are always of interest and value, provided they bear the stamp of genuineness and are not coined at the private mint of some popularizer of nature-study. With the latter we have no patience whatever. There is seldom need for a common name to be manufactured, for the simple reason that if the object is commonly known it will be found to have a common name already. Not infrequently this is an adoption of

the scientific name, with or without slight modifications. The study of the origin and significance of these names is an important branch of folk-lore, and they are not to be disregarded, but it is an error to bring them forward to designate species when exact information is meant to be conveyed. Ferns being so little known, have comparatively few common names, so that those who would understand what is written about them must of necessity learn the scientific ones. In America this presents fewer difficulties than seem to be imagined. We have only about forty fern families represented, and when one has learned the names and characteristics of these, he has a new pleasure in being able to refer to its proper place each new plant that comes to his herbarium. As to specific names, one needs to know them only as fast as he finds different species. It is as easy to begin by learning the scientific names as it is to memorize a lot of manufactured "common" ones, and the former way has the added advantage of making the student understanding and understood in the company of botanists anywhere.

* * *

CONCERNING The scientist, in his desire for exactness, has frequently found it necessary to overturn long ac-
NOMENCLATURE cepted names and replace them with others, which, while they may be older in point of time, are certainly newer to the student. Admitting that the scientist is right in his disposition of the subject, it is still pertinent for us to inquire whether these frequent changes are of benefit to our study. That the attempt to keep pace with modern methods in nomenclature tends to produce students of names, rather than students of plants, can scarcely be doubted. Nor can it be denied that the beginner, confronted with two or three different names for the same plant in as many different volumes, is likely to form an erroneous opinion of such study, and perhaps be deterred from entering upon it at all. Every additional change makes the confusion greater for all save the advanced student. It may be fairly asked, then, why those who love flowers and ferns for their educational or esthetic value should bother with synonymy. If the names by which we became acquainted with them are employed, all will understand to what plants they refer, and thus the student of ferns who objects to abandoning the old names may continue to use them conscious of the fact that he is not using the latest terminology, but is understood, nevertheless.

NOTES.

—Mr. Frances Windle, of Westchester, Pa., sends us an excellent photograph of *Botrychium obliquum*, showing one plant with three perfect panicles of fruit, and also a plant of the variety *dissectum*.

—"One Thousand Miles for a Fern" is the title of an article in the February *Asa Gray Bulletin*, in which Dr. Bessey tells of his trip to South Dakota for specimens of *Adiantum Capillus-Veneris*.

—According to F. H. Knowlton in the *Plant World*, *Selaginella apus* has been found fossil in the Yellowstone National Park, occurring in indurated clay which is assumed to have been deposited during glacial times.

—In the *Bulletin of Miscellaneous Information* of the Royal Botanical Gardens of Trinidad, Mr. G. S. Jenman is publishing "The Ferns of the British West Indies and Guiana." This is mainly an elaboration of his "Ferns of Jamaica," to include the fern flora of other West Indian islands. The work has now progressed as far as *Pteris*. We are glad to note that the ferns are now being paged separately.

—In a note to the *Botanical Gazette*, Mr. J. Schneck says that *Pteris cretica* should be added to the naturalized flora of Illinois. He has found it growing in several wells, a few feet below the surface, where even in midwinter the fronds were fresh and green. All stages of the plant were found, from the young frondlets to fruiting fronds. People elsewhere who have open wells, might take a hint from Nature in this respect and cultivate in this way, species that will not thrive above ground in their climate.

BOOK NEWS.

The companion volume to Dr. Coulter's "Plant Relations" has now appeared and is entitled "Plant Structures."* As its name indicates, it is concerned with the structural development of plants from the lowest algal forms to the dominant seed bearing groups. The necessity for following certain lines of development in treating the subject, prevents any author from displaying

*"Plant Structure," a second book of Botany, by John M. Coulter, A. M., Ph. D. New York: D. Appleton & Co., 1900. 348 pp. \$1.10.

much individuality in handling, and renders all volumes of this kind more or less alike. "Plant Structures," however, is lifted above the ordinary by the author's lucid style which makes the explanations of structure and growth not only intelligible, but attractive. Having shown the lines along which the higher plants have developed, the book gives a survey of the families of flowering plants and ends with chapters upon plant physiology and ecology. As in the former volume, the presswork and paper are excellent and there is a wealth of illustrations which illustrate.

Some interesting facts regarding the early fern genera will be found in Dr. Underwood's "Genera of Ferns,"† in which he reviews the literature of the subject from the time of Linnæus to 1832. The author first explains the principles by which he is guided in limiting fern genera, and then discusses the genera published, beginning with Hill (1756) and ending with Hooker and Greeville (1831). A summary of the genera proposed in which those with claims to validity are indicated, is also given. Those who object to changes in nomenclature will not be pleased to hear that if the rules set forth are strictly interpreted, we shall have *Athyrium* for parts of *Asplenium*, *Gymnopteris* for *Gymnogramme*, *Felix* for *Cystopteris* and *Dennstædtia* for *Dicksonia*. But whether the reader agrees with the conclusions of the author or not, the pamphlet is a valuable one for students of ferns to possess.

†"A Revision of the Genera of Ferns Proposed Prior to 1832," by Lucien Marcus Underwood, *Mem. Torr. Bot. Club.* Vol. V. No. 4. 8-vo., 42 pp. 25c.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—The Annual Report of the Chapter will soon be issued. It will contain the officers' reports and a list of Chapter members. All changes of address should be reported to the Secretary at once.—C.

—Professor W. A. Murrill having been obliged, through press of other duties, to resign from the secretaryship of the Chapter, the Executive Council takes pleasure in announcing the appointment of Miss Margaret Slosson to that position. All communications intended for the Secretary should be addressed to Andover, Massachusetts.—*W. R. M.*

A Second Fern Meeting.

It is proposed to hold another meeting for fern students, under the auspices of this Chapter, at the time of the annual meeting of the American Association for the Advancement of Science, which takes place in New York City from June 25th to 30th inclusive. Our meeting, as planned, will be held June 27th, which will be celebrated at the New York Botanical Garden as "Torrey Day," and at which a great majority of the botanists attending the Association meeting will be present. Various committees having in charge the several features of the meeting have been appointed, and it is hoped that a large attendance of all interested in fern study may be had. A preliminary program and circular of information will be sent to Chapter members as soon as possible. Others should address the Secretary for a copy.

Vice-President Gilbert, who has consented to serve as Chairman of the Committee on Program, requests that those intending to present papers correspond with him at their earliest convenience. Let there be a liberal response. Remember also that nothing adds to the interest and profit of such a meeting more than the presentation of short notes and queries and the exhibition of specimens. It is urged that this be made a special feature.—*W. R. M.*

Chapter Herbarium.

This department of our Chapter equipment, which was established last year, is already upon a thoroughly good working basis; and it is the earnest desire of Mr. Alvah A. Eaton, who originated the enterprise and has been appointed Curator of the Herbarium, that members contribute what duplicate specimens they can at an early date. To this end it is suggested that all members of the Chapter who attend the New York meeting bring with them as complete sets of their duplicates as possible, and deposit them with the Curator. In this way we can quickly bring together a series of representative specimens, which shall be available to members at any time. The Herbarium scheme is in every respect a worthy one, and since it has been so well begun it behooves every member of the Chapter to do his share in making it a complete success. Those who are not likely to attend the meeting are asked to send their duplicate set to the Curator, who will keep a record of all accessions and will render suitable acknowledgment for all specimens received.—*W. R. M.*

90 cts. per Year
15 cts. per Copy.

VOL. VIII.

No. 3.

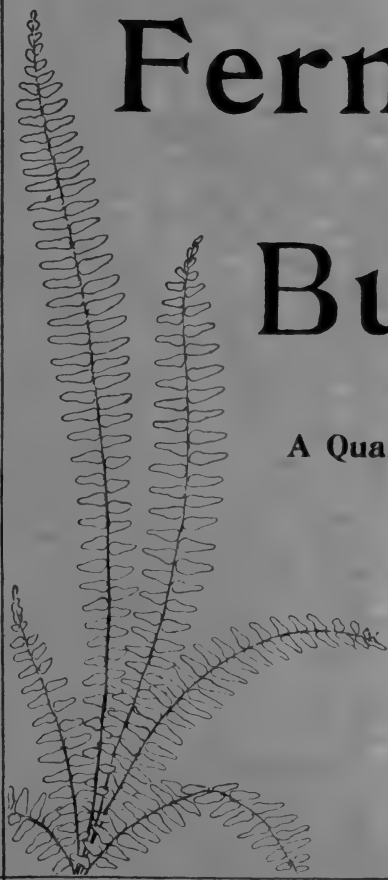
The Fern Bulletin.

A Quarterly Devoted to Ferns.

JULY.

Binghamton, N. Y.
THE FERN BULLETIN CO.

1900.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

If this paragraph is marked, your subscription has expired. The mark indicates the time it expired as follows:

- x—With the previous volume.
- 1—With the present number.
- 2—With the January number.
- 3—With the April number.
- 4—With the July number.

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. **Personal checks must contain ten cents extra for collection.**

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT. WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

BOOKS FOR SALE

"AMERICAN NATURALIST." Volumes 4, 5, 6, uniformly bound
Price, 75 cents each.

"PLANTS OF MAINE," by F. L. Scribner. Paper, 1875, 35 cents.

"HOW TO USE THE MICROSCOPE," by J. Phin. Cloth, 1890, 25 cents.

"GRASSES AND FORAGE PLANTS OF NEBRASKA," by Bessey and
Webber. Paper, 1890, 30 cents.

"FLORA OF IOWA," by J. C. Arthur. Paper, 1876, 25 cents

The prices include carriage.

NEWMAN F. McWARR, P. O. Box 2044, Philadelphia, Pa.

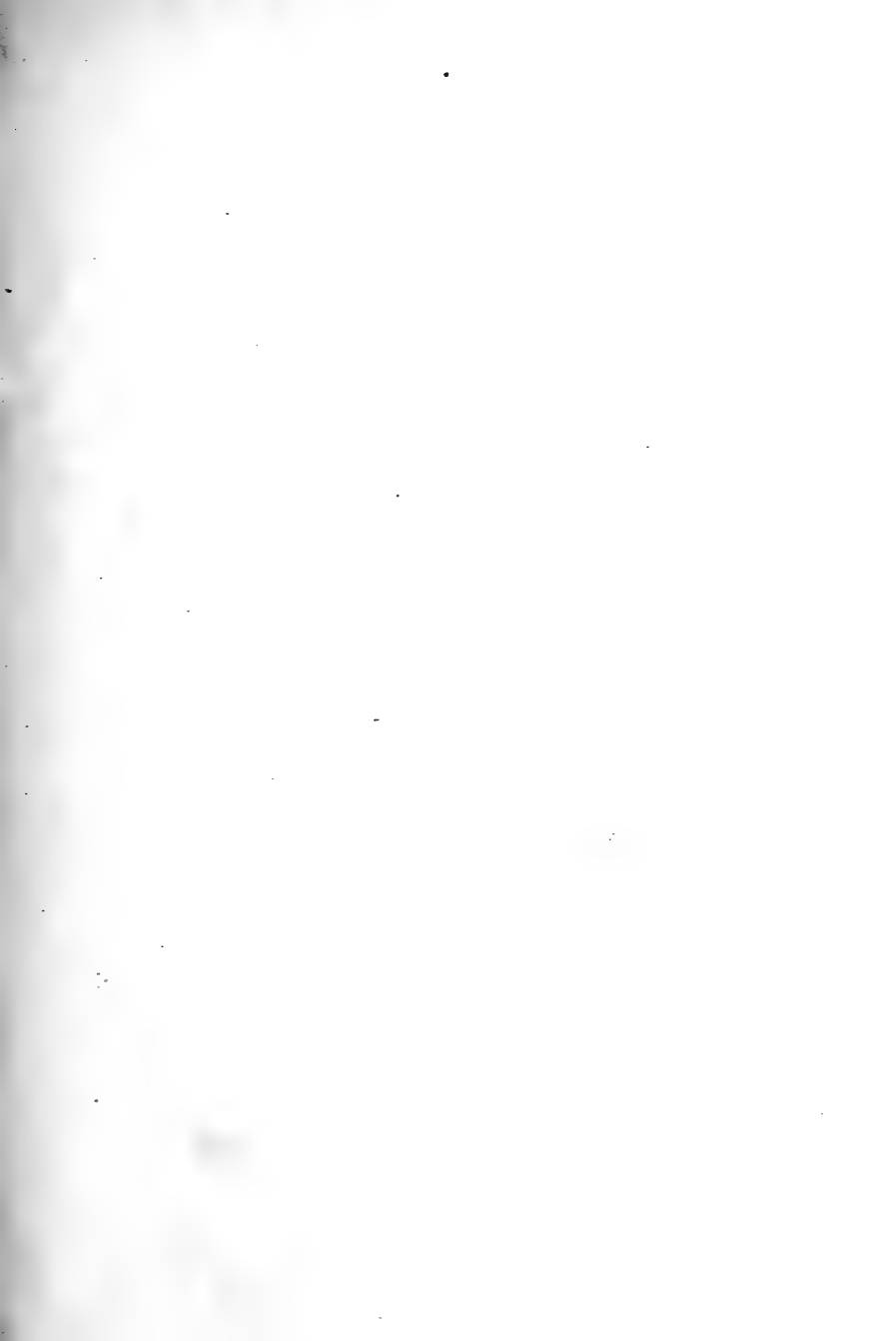
WANTS AND EXCHANGES.

Special announcements inserted here, for One Cent a word. No notice received for less than 25c. No charge for address.

FOR SALE—"Ferns of Iowa and their Allies," a 14-page descriptive pamphlet of interest to fern lovers. Only a few copies left. Price 10 cents. Address, T. J. Fitzpatrick, Iowa City, Iowa.

WANTED—To exchange sets of from 20 to 30 specimens of Eastern New York ferns, containing among others *Schizaea*, *Lygodium* and *Scolopendrium*, for an equal number from the Central, Southern or Western States. The Fern Bulletin, Binghamton, N. Y.

FOR SALE—About 100 sheets of Jamaica Ferns. Price, 10c. a sheet. For List, address Willard N. Clute, Binghamton, N. Y.





DANIEL CADY EATON

THE FERN BULLETIN

VOL. VIII

JULY, 1900.

NO. 3.

DANIEL CADY EATON.

BY PROF. WILLIAM ALBERT SETCHELL

DANIEL CADY EATON, Professor of Botany in Yale University, is the central figure in the development of our knowledge of the ferns of North America. He was the one who gave to us the first comprehensive account of our ferns, and it is due to him that so many of the troubles, once serious problems of fern identity and fern synonymy, have been so completely and so satisfactorily settled. He who starts to day to study ferns can little imagine the difficulties of this earlier work, largely because it was done so thoroughly and so well.

Professor Eaton was born September 12, 1834, at the little army post of Fort Gratiot, Mich. His father was Amos B. Eaton, later Brigadier General in the United States Army, and in charge of the Commissary Department during the Civil War. He served with distinction in the Mexican and Seminole wars, and, although actively engaged in the service of his country, he found some time to cherish an interest in botany and to collect an occasional rare specimen. General Eaton's father was Amos Eaton, Senior Professor in the Rensselaer Institute at Troy, N. Y., and one of the most prominent and influential figures in the history of botany in our country in the first half of the present century. The manuals of Amos Eaton were the only ones accessible and influenced all our earlier botanists. Amos Eaton, moreover, is said to have encouraged and aided John Torrey in his earlier botanical studies, Torrey influenced Asa Gray, and Gray, in turn, influenced and instructed the subject of our sketch. Historically and botanically, this direct succession is of very considerable interest.

On the paternal side, the descent of Daniel C. Eaton was from an old and distinguished colonial New England family of English origin. His mother was Elizabeth Selden, whose family had been long settled in Connecticut. He married Caroline, daughter of the late Treadwell Ketchum, of New Haven, and left two children, a daughter and a son, George F. Eaton, Ph. D., who is, at present, Instructor in Comparative Osteology in Yale University.

Daniel C. Eaton graduated from Yale College with the famous Class of 1857, and then proceeded to the Lawrence Scientific

School of Harvard University to carry on his botanical studies under the direct supervision of Asa Gray. During his career at both universities he had been making a specialty of the ferns, and his first paper, published while still an undergraduate, described three new species from Oregon and California, one of which had been collected by his father. During his stay in Cambridge he published papers on Japanese and Cuban ferns, and his inaugural dissertation for obtaining the degree of B. S., in 1860, consisted of an enumeration of the ferns collected by Wright and Fendler, in Cuba and Venezuela respectively, and additional forms collected in Panama by Schott and Hayes.

During the Civil War, Daniel C. Eaton was Clerk and Inspector of Stores in the Commissary Department, U. S. A., in New York, but in 1864 he was appointed to the chair of botany in Yale College, on a foundation provided by his relatives and friends. The Corporation of Yale University, in commemoration of his long-continued and valuable services, voted, in 1898, to name this the Eaton Professorship. At the date of writing no one has been appointed to this chair.

Notwithstanding his assignment to academic duties, Professor Eaton continued his work on ferns most actively, preparing the accounts of the Vascular Cryptogams for the several editions of Gray's "Manual," for Chapman's "Flora of the Southern United States," for Gray, Brewer and Watson's "Botany of California," the "Ferns of the Southwest" in Wheeler's "Report" for the U. S. Geological Survey, and numerous other smaller but no less critical and valuable notes in various journals and proceedings of learned societies. His crowning work in this line was, of course, the two magnificent volumes of his "Ferns of North America," with their eighty-one plates, most carefully drawn and colored, and ample but extremely carefully prepared text. This work will always remain a conspicuous landmark in our fern literature.

After the publication of the "Ferns of North America," Professor Eaton turned his attention more towards the Mosses and Liverworts, groups which he had continued to study at the same time with the ferns, but which had hitherto been more or less subordinated. His collections of these plants was very extensive and he devoted a considerable time to the study of the Hawaiian and Patagonian species of *Hepaticæ*, but he published little. These collections, together with additional materials, have been partially made known to the world by Professor Eaton's pupil,

Dr. A. W. Evans. At the time of his death Professor Eaton was engaged in an exhaustive study of the North American species of the genus *Sphagnum*. He published a check list of the North American species and varieties and issued the prospectus of a work to be entitled "*Sphagna Boreali-Americana Exsiccata*," to be undertaken in connection with Edwin Faxon, but did not live to complete it, his death occurring June 30, 1895. Much of the work of collecting and critical comparison had already been done, however, and in 1896 his son, Dr. George F. Eaton, most ably carried his father's ideas to completion, issuing 172 splendid specimens with catalogue and labels, prepared in most careful fashion. This collection represents most adequately the majority of the North American species and varieties, and will remain another monument to Professor Eaton's industry and ability.

While Professor Eaton is best known for his work on ferns and *Sphagna*, other groups of plants received from him very considerable attention. He wrote the *Compositæ* for the Botany of King's Expedition, and this piece of work is a classic in its line and has been very highly praised. At one time he devoted a very considerable amount of time to the marine algæ of North America, publishing lists of the species collected by himself at Eastport, Maine, and by Dr. Edward Palmer on the coasts of Florida and the Bahama Islands, and was associated with W. G. Farlow and C. L. Anderson in distributing the "*Algæ America-Borealis Exsiccata*."

Besides his botanical writings, Professor Eaton was the author of a number of genealogical papers, especially in connection with the Eaton and Selden families, as well as biographical records of the Class of 1857 of Yale College, of which he was the secretary. He wrote many reviews of botanical works for the *Nation* and the *American Journal of Science*, and compiled the definitions of botanical terms and names for Webster's International Dictionary.

While our interest, now, may be largely in Professor Eaton as a botanist and particularly as the leading authority of his time on the ferns of our country, yet it is impossible to estimate his work at its full value without considering the man himself. He was a lover of peace and thoroughness. He held aloof from controversy of a public nature, though having very decided views of his own on all important matters. He did nothing except in the most careful and accurate fashion, from the details of the release of the

arrow from the bowstring in archery to the preparation of a transverse section of a *Sphagnum* leaf. He was most generous to all who deserved it and to many who did not. He was simple in his life, and at his death all who knew him mourned him most sincerely.

University of California.

MARSILIA AT NIGHT.

By C. F. SAUNDERS.

IN the Botanical Garden of the University of Pennsylvania, *Marsilia quadrifolia* was planted some time ago in the pond devoted to aquatics, and is thriving finely, both on the grassy bank by the water's edge and for a distance of several feet out in the pond, where the leaves float in company with the fronds of *Salvinia natans*. One clear night in September, when the moon was shining, I walked through the garden and was interested to find the whole colony of *Marsilia* fast asleep in the moonlight—all at least except the floating leaves, and these, too, would doubtless have folded up but for the underlying water. The approach of night has the same slumberous effect upon the leaflets as upon those of an oxalis, although the manner of their folding is somewhat different. In *Marsilia*, according to my observation at least, the leaflets lay themselves quite evenly one on top of another, so that the result is as one leaflet—a tiny fan nodding at the summit of the stalk.

Philadelphia.

WHY DRYOPTERIS AND NOT LASTREA?

By LUCIEN M. UNDERWOOD.

THE tenor of two or three recent notes in THE FERN BULLETIN leads me to correct some impressions there conveyed regarding the nomenclature of our common ferns. Changes of nomenclature are always unfortunate and always to be regretted, but proper changes are made not as a matter of convenience, but of law. Had botanists always followed a definite principle instead of taking up whatever name they happened to find without inquiring into its priority rights or even caring for them, we would now be relieved of much of the change that has become necessary to conform to principle. Asa Gray stated in a nutshell

the ruling principle of botanical nomenclature when he said that for every plant there can be but one name and that is its oldest if tenable. This is merely a statement of a common law and common sense principle of every day application. We may add that this principle applies equally to the generic and specific name of a plant. Changes become necessary as our intimate knowledge both of botanical literature and of the plants themselves widens.

Considerable disturbance was manifested some years ago among fern lovers because the name more familiar to the present generation of Americans as *Aspidium* had been dropped for the earlier name *Dryopteris*; and now Mr. Druery laments because we do not use the name *Lastrea* for these plants as they do in England, surely forgetting that at Kew, the center of English fern study for three-quarters of a century, they use none of these names but instead, a fourth name, *Nephrodium*! Besides this Mr. Druery incorrectly speaks of the use of *Dryopteris* as "recent" and as originally "American."

The common shield ferns or buckler ferns or better wood ferns now so variously known in different quarters as *Dryopteris*, *Aspidium*, *Nephrodium*, or *Lastrea*, were known to Linnæus as species of *Polypodium*, since the generic characters derived from the growth of the stipe from the rootstock, as well as those drawn from the indusium, were not understood in his time. Adanson in 1763 was among the first to recognize the latter characters and he established several new genera, among which was the genus *Dryopteris*, which he characterized as follows: "Paquet de fleurs rond, disposés sur 2 rangs sous chaque division des feuilles. Enveloppe enparasol. Globules environnés d'un anneau élastique." For a representative of this genus he cites (in his index) the figure of "Filix-mas" given by Tournefort (1700) of the common male-fern of Europe.

Now this is absolutely the first generic name given to a member of this group of ferns; it is clearly characterized, firmly anchored to a type species, and there is no reason why it is not "tenable." Other genera established by Adanson in the same volume have never been questioned; among these are *Castanea*, *Asimina*, *Polygonatum*, *Talinum*, *Paronychia*, *Nelumbo*, *Pulsatilla*, and *Sabbatia*, some of them at least being names familiar to those who know our common flowering plants.

If, therefore, all the ferns with a superior umbrella-like indusium and roundish sori are to be included in one genus, that genus

by the law of priority must bear the name *Dryopteris*. If, as many believe, these ferns should be further grouped according to the shape and attachment of the indusium and the methods of veining into two or more generic groups, the name *Dryopteris* must stand for that group, larger or smaller, which contains the male fern (*Polypodium filix-mas* of Linnæus) since this is the type of *Dryopteris* of Adanson.

After Adanson, Schott was perhaps the next to use the name *Dryopteris* in his *Genera Filicum* (1834)*, and Asa Gray used it in the first edition of his manual (1848), including in it *Dryopteris Thelypteris*, *D. Noveboracensis*, *D. intermedia*, *D. dilatata*, *D. rigida* (with which he confused *D. Boottii*), *D. cristata*, *D. Goldieana*, and *D. marginalis*; later still Otto Kuntze (1890) used it in his *Revisio* transferring all the species given in "Synopsis Filicum."

Later writers established other genera for various groups of the ferns with superior circular or reniform indusia in the following order: *Polystichum* Roth (1799), *Tectaria* Cavanilles (1799), *Aspidium* Swartz (1801), *Nephrodium* Richard (1803), *Lastrea* Bory (1824), *Sagenia* Presl (1836), *Phanerophlebia* Presl (1836), *Cyrtomium* Presl. (1836), and several others, but space will not permit their discussion here. It is sufficient to add that the study of the historical literature of the ferns is not only highly interesting, but its careful perusal will often prevent us from making serious blunders.

Another question of proper nomenclature is involved in the various forms of the common brake which the editor has recently well characterized. We will not refer either to the generic name or to the number of species involved, concerning both of which questions there will be differences of opinion. In accepting a name it must first be determined to what plant the name was originally applied. This often requires access to a large library of fern literature. If the plant is not American or if its range extends to the tropical regions of America, even, access to a large array of material is necessary. Such an array is not yet accessible in any American collection, even the best; hence the necessity of supplementary study of the Kew, Berlin and Paris collections,

* Those who advocate the absurd "fifty year" principle which makes a genus good if somebody happened to use it in a "reputable work" forty-nine years after it was first established, but not if it happened to be fifty-one years before it was so used, will find here a loop-hole through which they may crawl in order not to use *Dryopteris*. But even this will not enable them to use either *Aspidium* or *Lastrea*, as the context shows.

where the types of Fee, Hooker, Mettenius and others are stored, and, what is sometimes even of greater importance, a much wider array of exotic material can be studied. *Pteris lanuginosa* Bory was a name given to a fern found in Mauritius. Just what this fern is, is not clearly known; but it is certain that it has nothing to do with the pubescent brake of Western America; this form, therefore, be it variety or species, cannot bear the name *lanuginosa*, and I have abandoned this name in the sixth edition of my fern book now in press. Likewise under the name *Pteris caudata* Linnæus confused two things, both from tropical America, and American collections have not yet satisfied me to what form the name properly applies. I have therefore left it *in statu quo* until it can be more certainly determined. *Pteris esculenta*, which is referred as a synonym to *P. caudata*, was based on an Australian thing and may (or more likely may not) be the same plant that has been called *P. esculenta* from the American tropics. Undoubtedly *Pteris aquilina* is a composite species, but the full study of a group distributed from Australia to Sweden and from Cape Horn to Labrador and Alaska involves more difficulty of elucidation than might at first seem; it is not a question that can be finally settled in America alone; every careful study of our plants, their exact definition and distribution, contributes to their final elucidation, and I am glad the editor has given us this contribution.

Columbia University, 25 May, 1900.

[The editor does not wish to be understood as having attempted to sort out bracken nomenclature; that is so well tangled up that it is doubtful whether any botanist can straighten it out in a way satisfactory to the rest. What he did attempt was to separate the forms in North America and define their ranges. Having passed through thousands of acres covered with the so-called variety *caudata*, it needed no further array of foreign material to show him that the plant is quite distinct from *P. aquilina* of Eastern America in both habit and shape. He was therefore moved to give the commonly accepted name to this plant until others shall have worried an interpretation out of Old Linnæus.—ED.]

—In the *Churchman* for May 5th Mr. C. F. Saunders has a very entertaining and instructive article upon "The Ferns' Poor Relations," which treats of the Club-mosses, Scouring-rushes, etc. Six excellent illustrations by Miss E. M. Hallowell accompany the article.

HELPS FOR THE BEGINNER.

I.—THE POLYPODIES.

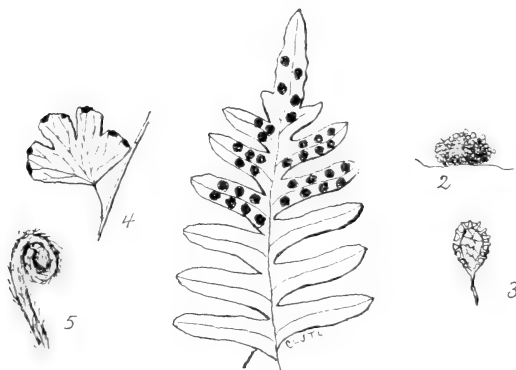
IT frequently happens that even the fern books designed for beginners, take up the subject at a point beyond the comprehension of those they are trying to help. One who has always busied himself with flowering plants, where the identification is principally concerned with the flower and fruit, is sure to have some trouble in trying to discover the names of common ferns by means of keys whose very terms are new and perhaps meaningless to him. Such words as spores, sori, sporangia, indusia, fruit-dots and pinnæ rise up to confuse him, and after a study of the scientific description has served to make nothing certain but uncertainty, he is quite likely to conclude that he cannot master the subject alone; but, turning the page, a few lines of popular description catch his eye, and there he recognizes his plant. Such occurrences are by no means rare. We may feel pretty sure of our plant, but we can never be too sure. In the hope that some of these notes of a more popular nature may assist the young student, this series of articles is written.

There are several species of polypody on the Pacific Coast, but in the Northern and Eastern States we have but two. Of these, one is so abundant as to be called the common polypody (*Polypodium vulgare*). It grows on almost every rocky outcrop that one may chance to visit, and at any time of year may be found, for it is an evergreen. It frequently grows on the earth in the vicinity of rocks, but it has a marked preference for the tops and shelves of cliffs, often in quite exposed places. One may know it by the thickish, smooth, green fronds, cut almost to the midrib, the slender creeping rootstock, and the large round clusters of spore-cases on the under side of the fronds. None of the other ferns that frequent the same places have these characteristics.

The second species is the little gray polypody or "Resurrection fern" (*P. incanum*). This species does not get much farther north than the Ohio river. It looks very much like our common species, but need never be confused with it, for it has the under side of the frond covered thickly with grayish, dark-centered scales. It grows on rocks and the trunks of trees often in places where the supply of moisture is very precarious, and has the curious faculty of curling up in dry weather, in a sort of suspended animation, uncurling again when it rains. This gives it the name of Resurrection fern. It is supposed that the scales with which

it is covered assist in preventing the evaporation of its scanty supply of moisture during dry periods. While rare in the Northern States, it is most abundant in the tropics, where it grows on stone walls, the branches of trees, roofs of houses—in fact almost anywhere it can obtain a foothold. A great tree with all its branches covered with the clustering fronds of this fern is an interesting sight. Its ability to resist drought enables it to grow in situations where it finds few competitors of any kind.

Our common polypody, while it is not so capable of enduring heat and dryness, nevertheless manages to exist under widely differing conditions, as may be assumed when it is known that it is found in nearly all the countries in the Northern Hemisphere. In the moister atmosphere of Great Britain it is said to grow on



walls and trees, in the mouth of wells and under hedges, and is reported to wither at the approach of frost. Here it is evergreen, the old fronds not only enduring a temperature of several degrees below zero unharmed, but lasting for some time in the following spring.

The polypody family is one of the largest of fern families. It has its best development in the tropics, where the species are not only numerous but exceeding diverse in form. The fronds range from entire to very finely divided blades, and in size from those that can be covered with one's thumb to others that are two or three feet across. Some produce their fronds in tufts, others have slender rootstocks that ascend the trunks of trees for many feet, while others have nearly the habit of climbing vines. All,

however, may be distinguished from other ferns by the form and arrangement of the fruit-dots. Our species may be separated from Eastern American ferns by the following key:

Fruit-dots round, without indusium, on the backs of ordinary fronds.

Fronds simply pinnate or nearly so.

smooth, *P. vulgare.*

scaly, *P. incanum.*

The word polypody is said to be derived from the Greek and to signify many feet in allusion to the branching rootstock of some species. A less fanciful derivation, and probably the correct one, would make it derived from the creeping rootstock of many of the species, in which the numerous rootlets may be taken for feet. There are nearly 400 species in the genus. In our illustration figure 1 represents the tip of a frond of *P. vulgare*; 2, a sorus enlarged, and 3, a single spore-case still more highly magnified; 5 is a young fern "crozier," as the buds of ferns are called, showing that the young fern leaves are coiled instead of folded, as other leaves are; 4 is a pinnule of another fern showing the forking veins possessed by ferns.

NOTES ON AMERICAN FERNS—II*

BY WILLIAM R. MAXON.

POLYPODIUM vulgare acutum Moore? On August 24th last, the writer, in company with Mr. Charles L. Pollard, collected (No. 25) on the mountain side at Quinnimont, W. Va., several plants of a form of *Polypodium vulgare* which offer certain peculiar characters not observed by us in other American specimens. The most noteworthy features are: The extremely scant, skeleton-like foliage, the large size and the peculiar serrate-alternate apices of the fronds. The specimens may be characterized as follows:

Rhizome rather slender, creeping, densely clothed with light brown spreading chaff; stipe 5-8 inches long, pale green, smooth; lamina very dark green above, decidedly bluish green below, 6-11 inches long; pinnæ distant from once to twice their width, each tapering from its middle to a somewhat acute (occasionally sharply acute) apex, base broadly decurrent, veins sinuous and promi-

*Published by permission of the Secretary of the Smithsonian Institution.

nent in drying, veinlets forking usually twice, and rarely anastomosing; the tip of the frond long acuminate (as in *P. falcatum*), crenulate, dentate, then serrate as it gives rise to the pinnæ; sori round, far apart, often irregularly disposed.

In general appearance the plant is very different from ordinary *vulgare*; but in diagnostic characters sufficient to warrant its separation from that species it seems to be lacking. It is with considerable misgiving that I refer this plant to the variety *acutum* described by Moore,† although the apical form and the shape of the pinnæ appear very similar, except that the West Virginia fronds are rather longer and scantier. The latter circumstance added to the fact of meagre fructification suggests a variation due to unusual environment. The ferns grew well shaded, in considerable abundance, forming a good sized tuft upon some sloping rocks on the bank of Laurel creek, at Quinnimont; and, though no especial observation was made at the time, I should take them to represent the common form of the locality.

In the Underwood Herbarium is contained a sheet of specimens from Virginia, communicated by Prof. W. A. Murrill, which bear considerable resemblance to the Quinnimont specimens, especially in the shape of the pinnæ, but are rather smaller. Perhaps both are to be referred to a southern form not yet understood. I shall be glad to know of other collections of a form of this description.

Washington. D. C.

A NEW BOTRYCHIUM FROM JAMAICA

BY LUCIEN M. UNDERWOOD.

AMONG the interesting ferns and fern allies which Mr. Clute found in Jamaica is a *Botrychium* of the *ternatum* group of which I had previously seen only a single specimen at Kew, collected by Mr. Nock, and communicated to the herbarium by Mr. Jenman, for whom I had already given the plant a name in my manuscript notes. It is fortunate that Mr. Clute, who is familiar with our eastern species, has had the opportunity to observe this plant in the field and add something to our knowledge of its habital and seasonal characters.

BOTRYCHIUM JENMANI sp. nov. Root fleshy, from a short axis 1-2cm. long; sterile lamina separating at a height of 1-2cm. and

†Moore: Nat. Pro. Br. Ferns, 1:63, pl. II. fig. a. 1859.

usually at or below the surface of the ground; leaf stalk 2.5-4cm. long, flesh colored or pinkish; lamina 3-12cm. wide, 2.5-9cm. high, composed of a central bipinnatifid portion, and two similar but smaller lateral ones which take their origin alternately at distances varying from 5-15mm.; lower lateral division the larger with 4-6 lateral pinnules, each composed of 3-5 oval segments with finely crenate margins; venation indistinct except in younger laminæ; sporophylls 12-22cm. long, including the rather compact mostly tripinnate panicle.

Cinchona, Jamaica, alt. 5,000 feet, W. N. Clute, 6 Feb., 1900, growing among bushes and along trails on a dry and rather exposed hillside, in company with *Lycopodium clavatum*, *Pteris longifolia* and others. Type in Herb. Underwood.

The Kew specimen above mentioned is labeled "Jamaica, Jenman, No. 12. Found by Mr. Nock at 5,000 feet alt.; rare. The only plant he has met with of it." Later Mr. Jenman must have found more of it, for in referring to it as the Asiatic *B. ternatum* he reported it as "common" in his "Ferns of Jamaica."

This adds another to the series of the *ternatum* group which mature their spores early in the year; Mr. Clute informs me that unlike our species the leaves of *B. Jenmani* are annual and do not persist throughout the year. It will be noted that the time of maturity for Jamaica is the same as for the Jamaica representative of the *Virginianum* type which Mr. Clute also collected.

Columbia University, 29 May, 1900.

A NEW VARIETY OF ISOETES

BY A. A. EATON.

A SHORT time since I received through the kindness of W. W. Ashe, two sets of Isoetes from different localities in North Carolina, which could not be satisfactorily placed. A study of the material in the U. S. National Museum revealed additional specimens from the Biltmore herbarium. The leaves are usually very stout, and the appearance is characteristic, but the spores show it to be nearly allied to *Engelmanni*, to which I attach it as a variety, though further investigation may show it to be distinct. It may be described as follows:

ISOETES ENGELMANNI CAROLINIANA var. nov. Size of type, but leaves broader, (2-3mm), velum covering half to two-thirds of the unspotted sporangium, which in the inner leaves is often 1cm.

long by .4cm. broad. Macrospores 400-540 μ in diameter, marked with tall, thin laminæ, usually anastomosing on part of the surface, but some of them always isolated, often retuse spinules; microspores light cinnamon, 28-31 μ , muricate with low distinct crests or broad blunt spinules. Differs from the type in its broader leaves, broad velum, more scattered sculpture and brown microspores, which are larger and densely muricate.

The sculpture of the spores in the species is very characteristic and fixed, being regularly honeycomb reticulated except occasionally above, where there may be long crests or walls. The variety, on the other hand, has reticulations as an exception, and they are more circumscribed in area and larger than in the species, the prevalent marking being jagged, irregularly anastomosing crests, and spores are not rare which would pass for those of *I. echinospora Braunii*. Type, *Ashe*, Big Rock creek, Mitchell Co., N. C., 1893. (No. 1092). Cotypes: Flat Rocks, near Salisbury, N. C., growing partly emersed. *Ashe* 812. In bogs formed by cold springs on Spring Mt., 3000 feet altitude, near Columbus, N. C., May 5, 1897, Biltmore Herb. 5564 (immature with very stout leaves, 3mm. wide, but spores and roots characteristic.) Cold, boggy places, base of craggy Mt., Buncombe Co., 5-19-98. Biltmore, 5564^b. Very immature, Roandale Farm, N. C., Aug. 1, 1895, *A. G. Wetherby*. The last three specimens are from the National Museum.

In a recent letter Mr. Wetherby says: "Roandale Farm is my plantation and Big Rock creek runs my mills." He very kindly offers to collect a series for further study, and students will probably be able to secure abundant specimens from him.

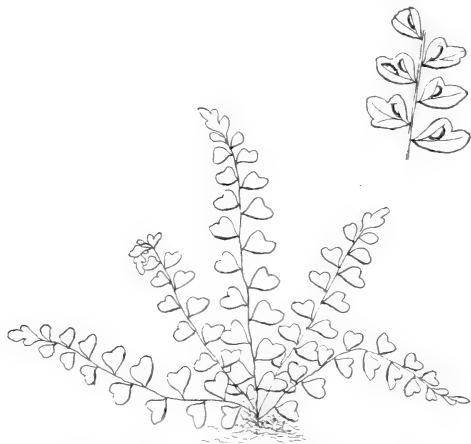
Seabrook, N. H.

While in Vermont last Summer I found *Asplenium angustifolium* for the first time, and was interested in the variety of forms of the pinnæ. The normal form was linear-lanceolate, acuminate, entire. The fertile pinnæ but half as wide as the sterile. In some fronds four or five of the upper pairs of pinnæ were perfectly round, about the size of small peas, with the terminal pinna lanceolate like those below. Other fronds were normal except having pinnæ that were lobate at the base, small, narrow lobes growing a little blunter toward the apex. Is this the usual habit of *Asplenium angustifolium*?—*Mary W. Bidwell, Glastonbury, Conn.*

TWO NEW FERNS FROM JAMAICA

BY B. D. GILBERT.

ASPLENIUM CLUTEI. Caudex short with copious fibrillose radicles and minutely paleaceous at the summit. Stipites clustered, prostrate, 1-3mm. long, with minute filiform scales; laminæ 1½-4cm. long, 4-6mm. wide, pinnate; rachis filiform green, compressed, slightly winged in the upper part; texture thin, membranaceous; pinnae 6-12 pairs distinctly stalked on the lower two-thirds of the frond, above that slightly adnate-decurrent, wedge-shaped or flabellate, 3-4mm. long, 1-3mm. wide, terminal one cuneate flabellate, two-lobed, blunt, those next below obovate, entire; lower ones obcordate with a single vein in each lobe or occasionally the vein in the lower lobe once forked. Sori generally one on the exterior vein opening toward the inferior vein, sometime one in each lobe large for the size of the pinnae; indusium, when young, light green nearly the same color as the pinnae, greenish-white in age slightly fimbriate on the edge.



Asplenium Clutei, Natural Size.

An extremely delicate and tiny fern as thin and translucent as a filmy, no larger than *A. pygmaeum* Hook., which that author characterized as "the smallest of the ferns (save in *Hymenophyllaceæ*).", prettier in form than that species and nearer to *A. projectum* Kze. It differs from the latter in the shape of the pinnae and in not having a proliferous apex. At first sight it recalls *Polypodium exiguum* Griesb., being about the same size as that

species. It belongs in the same section of *Asplenium* as *A. viride* and *A. dentatum*. The obcordate pinnae are rendered so by the development of an auricle on the upper side of the base, which often grows to the same size as the original pinna. The sinus between them makes the entire pinnae beautifully heart-shaped, with the apex of the heart at the stalk or connection with the rachis. The alliance is with *A. viride* on account of the greenish rachis.

Collected Feb. 10 at New Haven Gap, Jamaica, W. I., altitude 5600 feet, where it was growing on the moist soil at the base of an overhanging rock. Rare (No. 118.) Mr. Clute is to be congratulated on the discovery of this tiny species, inasmuch as it was on ground that has been frequently traversed by preceding botanists. It shows that there is still new material in Jamaica for the collector with sharp eyes, and who possesses a fair knowledge of what has already been found there.

POLYSTICHUM TENUE. Caudex short erect, covered with light-brown acute scales 5mm. long. Fronds 18–24cm. long, stipites caespitose, 3–11cm. long, slender, light-green, clothed throughout with light-brown, acuminate, contorted, generally reflexed, scales; rachis slender, furfuraceous, pale, slightly flexuose, and margined in the upper part; lamina 14–24cm. long, 4–6cm. wide, very acuminate, often widest at base but sometimes about the same width from center down, simply pinnate for two-thirds or three-fourths of the upper part, below that bipinnatifid to bipinnate, firm, membranaceous, pinnae numerous, rhomboid-ovate with distinct stalks, closely set, lower base obliquely cut away, upper truncate parallel with the rachis, auricled, serrate with shallow spinulose teeth, lower pinnae with basal segments generally fully separated and sometimes one or two other pairs; segments roundish ovate, spinulose only at point. Sori small, round, naked, rather nearer the edge than midrib, always on the anterior branch of the veins, in two lines; in the auricle also two lines; the veins free, branched 1–4 times.

The absence of an involucre would, according to former methods of classification, place this fern under *Phegopteris* as a mere section of *Polypodium*, but the time has gone by for a classification of that kind. These strongly polystichoid species must be placed in *Polystichum* whether they have an involucre or not. The alliance of this species is with the *aculeatum* section of *Polystichum*, but its characters are sufficiently distinct to render

it a good species. Mr. Clute, who gathered it in association with *Polystichum platyphyllum* Willd., says that he could see no intergrading of these two, and that was my own experience in 1895. Its distinguishing points are the long, narrow, slender, frond, as indicated in the specific name, the delicate texture, the fact that two-thirds of the frond is simply pinnate, the distinctly stalked pinnæ and the reflexed scales. Frequently there is a bud on the rachis or on the stipe of one of the pinnæ one or two inches from the tip of the frond, which shows a tendency in this species to be gemmiferous.

Mr. G. S. Jenman in his "Ferns of Jamaica," mentions this form under *Aspidium aculeatum* as "the smallest state of all, (which) is 1-1½ in. wide and bipinnate only at the base." But both texture and form seem to me to separate it distinctly from *Aspidium aculeatum*, even if the uniformly non-indusiate sori did not.

Gathered at Clyde River, alt. 3,000 feet, by Clute, in 1900, No. 139, and at Mandeville, by Gilbert, in 1895.

A LIST OF THE FERNWORTS COLLECTED IN JAMAICA

BY WILLARD N. CLUTE.

ACCORDING to Jenman's work on the ferns, the island of Jamaica has 489 species of ferns and 27 of the allies, or about one fernwort for every four flowering plants. This makes it one of the richest localities in the world of ferns, but owing to the very local distribution of many species a complete collection is practically impossible. In the number above mentioned are included numerous species which have been collected only once, or have been referred to the island upon the authority of specimens so labeled in Herbaria, although not seen in a fresh state by modern botanists. The number of species which a collector might secure by visiting such parts of the island as are easily accessible is probably not far from four hundred. In my stay of two months last winter, during which many flowering plants, also, were collected, I was able to secure about 250 species. Later I hope to mention more fully some of the experiences of fern collecting in Jamaica, but at present it seems expedient to publish the list of fernworts collected with such notes as seem pertinent. In distributing my plants, they were labeled to agree

with Jenman's "Ferns of Jamaica;" in this list some will be found to be different, and more in accord with our ideas of nomenclature. The numbers in parenthesis are those under which the species were collected and distributed. The localities given are all in the eastern part of the island.

MARATTIACEÆ.

MARATTIA Sw.

1. *M. alata* Sm. A large succulent fern common in moist forests. Morce's Gap. (179).

DANÆA Sm.

2. *D. stenophylla* Kze. Common in moist forests. A curious fern with several swollen joints in the stipe. Morce's Gap. (105).
3. *D. nodosa* Sm. Above Moore Town. Two specimens. (270a).

OPHIOGLOSSACEÆ.

OPHIOGLOSSUM L.

4. *O. reticulatum* L. In moist grassy places along roadsides. Cedar Valley. Not common. (153).
5. *O. palmatum* L. Growing in tufts on trees above Moore Town. Rare. (275).

BOTRYCHIUM Sw.

6. *B. Jenmani* Underw. The species is described elsewhere in this issue. (63).
7. *B. Virginianum* Sw. Frequent in moist forests in Jamaica. This plant is peculiar for always having two fronds, the frond of the preceding year remaining through the winter, although the fertile part dies. (96).

OSMUNDACEÆ.

OSMUNDA L.

8. *O. cinnamomea* L. This fern is rare in Jamaica. I collected it at Salt Pond near Guava Ridge, at an altitude of about 4,000 feet. (242).

HYMENOPHYLLACEÆ.

HYMENOPHYLLUM L.

9. *H. abruptum* Hook. On trunks of trees, Morce's Gap, common. (54).
10. *H. asplenoides* Sw. On bases of trees, John Crow Peak. Not common. A handsome species with pellucid fronds and large involucres. (75).

11. *H. polyanthos* Sw. Common on many kinds of trees at nearly all altitudes. There is considerable variation in the fronds. (274).
12. *H. sanguinolentum* Sw. On trees, New Haven Gap. Not uncommon. This is Jenman's *H. polyanthos*, var. *sanguinolentum*, but seems distinct enough to be considered a species, as Swartz placed it. (206a).
13. *H. clavatum* Sw. Morce's Gap, on trees, not common. (50).
14. *H. lanatum* Fee. Most abundant. Nearly always present where the situations are favorable. Can be peeled from the trunks in large sheets. The fronds are brownish-green in color. (84).
15. *H. sericeum* Sw. Another common filmy fern growing usually on horizontal trunks and limbs where the fronds may hang straight down. Fronds brown and woolly, the inner portion usually dead. (98).
16. *H. hirtellum* Sw. Morce's Gap. Only two specimens collected. (123).
17. *H. Catherinæ* Hook. Morce's Gap, on trees. A finely cut species, but nevertheless quite rigid. In appearance much like *Trichomanes trichodeum*. (274a)

(To be Continued.)

The note from E. J. Hill, taken from *Torrey Bulletin*, speaks of Pellæa as preferring a sunshiny place. The first plant I found was on a rock where it would receive some sunshine, but the specimens were small and starved. The best find was on the face of a cliff, or in the crevices, in deep shade where the sun never penetrated. The plants were large and luxurious, most of the fronds being eight to ten inches long.—Mrs. E. C. Anthony, Gouverneur, N. Y.

The number of spores formed within a microsporangium [of Isoetes] is enormous—much greater than in any other living plant. In some species it is said to exceed a million, but the largest number I have found in *I. echinospora* is 300,000. My estimate places the average number from 150,000 to 250,000. As is well known, no provision is made for the dehiscence of the sporangium wall. The spores are set free only by the decay of the tissues enclosing them.—R. W. Smith in *Botanical Gazette*.

A NEW DRYOPTERIS FROM JAMAICA

BY WILLARD N. CLUTE.

WHILE collecting ferns in the vicinity of Cuna Cuna Gap, Jamaica, early last March, I found at an altitude of about 2,500 feet a handsome species of *Dryopteris* growing in moist shaded spots. Being well loaded with other plants at the time and thinking it some common species, I gathered but four fronds, and was quite surprised upon reaching home to find that it did not agree with any species in Jenman's "Ferns of Jamaica." Subsequent reference to the "Synopsis Filicum" gave no better results and I am therefore persuaded that it is a new species, although it is difficult to understand how so conspicuous a fern could escape the eyes of fern collectors for so long. I would describe it as follows:

DRYOPTERIS GILBERTI n. sp. Caudex not seen. Frond 75-110cm. long; stipes 35-40cm. long, densely clothed at base with brown, shining, narrow-lanceolate scales 1-1½cm. long spinescent upon the edges, above clothed with similar scales which grow shorter and fewer, leaving tubercules when they fall away; stipes deeply channelled, medium brown; lamina 40-70 cm. long, sub-deltoid, tripinnatifid, acute, lowest two or three pairs of pinnae longest, the lowest pair broadest and deeper on the lower side 16-20cm. long, 6-9cm. wide, sessile except the lowest pair; costae, costulae and general lower surface canescent, above less so; pinnae pinnate, pinnules sessile, all except a few of the lower ones adnate and decurrent on the inferior base; lower pinnae cut nearly to the costa, upper shallowly lobed or toothed, segments very blunt, slightly falcate, entire; veins free, sometimes forked pinnate in the segments; sori apparently naked, uneven in size, 2, 4, or 6 in each segment, nearer margin than midrib and extending nearly to the tips of the segments.

The affinities of this species are with *D. villosa* (L.) Kze., from which it differs in the smaller, more delicate and compact fronds, the smaller *spinescent* scales, blunt pinnules, flexible rachis and smaller, apparently non-indusiate sori. The description is based upon specimens in my own herbarium, collected at Cuna Cuna Gap, March 7, 1900, No. 200a.

I take pleasure in naming this fern for Mr. B. D. Gilbert, whose kind assistance toward making my trip to Jamaica a success, I here gratefully acknowledge.

EDITORIAL

A BRITISH VIEW

The Gardening World, of London, takes exception to THE FERN BULLETIN'S recent statement that the ideal collection of ferns is one which contains representatives of each species from as many localities as possible, and fears that we may be encouraging collectors to root out our rare species. In conclusion it observes: "If there are less than two hundred species of ferns in North America, north of Mexico, not a few of which, we suspect are rare, how many dozens of species would there be in a dozen years if all the fern 'students' could get a single specimen each? What is it all for? What do the fern students want to do with the knowledge they are so eager to amass? If there is healing or medicinal qualities in any parts of the ferns they so carefully uproot, press, mount and study, they might collect and sow spores to get stock and otherwise. If not, if it is knowledge for its own sake, I'd rather they than me." This may be assumed to reflect the general opinion in England regarding any part of fern-study that does not consist of cultivating and multiplying varieties. The trouble with our contemporary is that it views the situation without due regard to the fact that "circumstances alter cases." Our country is big and comparatively new, and we have not yet arrived at an exact knowledge of our ferns. We must still collect and study. If our two hundred species were assembled in a space no larger than England, and all our fern collectors let loose among them, some fears of their extinction might be entertained; but fortunately our fern-flora presents few or no instances of stations so limited in area and at the same time so accessible as to make their extermination probable. While the Englishman seeks his plants in some single wood, bog or crumbling castle wall, the American pursues the same, or similar species, over thousands of square miles of forest, swamp and ravine. The former is prone to forget that our two hundred species are scattered through a country about sixty-five times larger than his own. Probably not a single State in the Union contains more than fifty species of ferns, and yet some twenty of these States are each as large or larger than England, while several are from two to four times as large. We mention the foregoing, not by way of boasting, but to show how difficult would be the task of rooting out our species. The rare ferns are usually confined to one or two States and in localities so far removed from railways that only those with abundant time and means could afford to collect them. And

when Nature decides to make one of our ferns in quantity, she fairly over-does the matter and no one need fear to collect as many as he desires for fear of exterminating it. The bracken is fairly abundant over an area of more than a thousand miles wide and two thousand miles long. The *Dicksonia* is so common in the northeastern States that it is frequently cut for hay. The *Osmundas* will not be exterminated in eastern America until the last swamp is drained, and, while our forests stand, we can count upon enough woodland species for ourselves, and plenty to spare for our British cousins.

NOTES

—The first catalogue of the plants of Oklahoma was issued recently from the Oklahoma Agricultural Experiment Station by E. E. Bogue. Ten ferns and three allies are listed.

—It has long been surmised that the fern in California, known as the variety *incisum* of *Asplenium trichomanes*, was incorrectly referred to that form. In the *Bulletin of the Torrey Botanical Club* for April, William R. Maxon has given it specific rank under the name of *Asplenium vespertinum*. It is found in a few counties of California, and, curiously enough, the very cosmopolitan *A. trichomanes* does not occur in the same region.

—A list of the plants collected by Dr. C. F. Millspaugh upon the cruise of the yacht *Utowana* to the West Indies during the winter of 1898-9 has been issued by the Field Columbian Museum. Mr. G. E. Davenport, who identified the ferns, records *Woodwardia radicans* from Jamaica, his identification being based upon sterile fronds. If no mistake has been made, this adds another species to the fern flora of that island, a noteworthy event, since it has been often and thoroughly explored by fern collectors.

—An interesting freak of *Dryopteris marginalis* came to my notice this season. The plant was removed from one place in my grounds in the early Summer where it received no sun, to another where the sun shone upon it for a few hours. It put up several fronds which were all more or less twisted and contorted, but without any fruit. After the long drought of the Summer, lasting more than six weeks, a few gentle showers gave new life to the fern, for fruit appeared on all the leaves, but only on the tips. The leaves were quite mature at the time, which was about the middle of September.—Mrs. E. C. Anthony, Gouverneur. N. Y.

BOOK NEWS

Another installment of Jenman's "West India and Guiana Ferns" has appeared. It is devoted to *Pteris*, of which there are thirty-eight species in the region covered.

Dr. Underwood will soon begin issuing a revision of the ferns of North America as far south as the Isthmus and including the West Indies. It will appear in parts of quarto size, and will probably illustrate all the species not before figured. Many of the drawings for the early numbers have already been made.

We note with regret that *Erythea*, after an existence of about seven years, has given up the ghost, leaving the region beyond the Mississippi without a representative among botanical publications. We feel like "turning a rule" for *The Museum* also, which recently lost its identity by being merged with an Iowa publication.

Mr. George E. Davenport is preparing to issue a series of photographs of New England ferns, with descriptive text, for use in the public schools. The photographs are made from herbarium specimens in his own collection and are now ready. The admirable idea of arranging closely allied specimens in the same photograph where their differences may be easily studied, has been adopted. The text will be issued in parts as rapidly as possible. Many who are not teachers will be glad of a chance to secure these leaflets, since Mr. Davenport's long experience with ferns renders very pertinent what he has to say concerning them.

The best book on trees that we have yet seen is from the pen of Harriet L. Keeler and the press of Charles Scribner's Sons. It is entitled "Our Native Trees and How to Know Them,"* and describes the trees that occur in the region between the Atlantic ocean and the Rocky mountains and from Canada to the northern boundary of the Southern States. Throughout the book the author seems to have had in mind the fact that even beginners want something more than the mere name of a tree, and has added numerous facts and fancies about each species, derived from various sources. In this age of botanical book-making without sufficient preparation, it is refreshing to find an author with so comprehensive a knowledge of, and such thorough sympathy with her subject. The botanical descriptions of each species precede the more popular matter, and are arranged under such heads as bark,

* "Our Native Trees and How to Know Them." By Harriet L. Keeler. New York: Charles Scribner's Sons, 1900. 533 pp. \$2.00 net.

wood, leaves, flowers, fruit. The common names, so far as known, are given. Another important feature is that more than half of the 340 illustrations are from photographs. There is also a good key to the species and a comprehensive glossary. That the book is a fine specimen of the book-maker's art is beyond question. If we could have but one book on trees, we should certainly choose this one.

It is safe to say that a large majority of our botanists have but a hazy idea of the lower forms of plant life. All too frequently the individual who browses among flowering plants imagines the domain of botany to stop somewhere short of the mosses, and is quite willing to let the lower plants go as not worth attention. The excuse for this neglect of the lower plants was that one's knowledge of such forms had to be sought in many and often rare books, making it often difficult or impossible to study them. Now that it is becoming fashionable to have at least a speaking acquaintance with them, the botanist will welcome Prof. Underwood's book on "Moulds, Mildews and Mushrooms," † which in a single volume gives an account of the more conspicuous North American species. The book is mainly devoted to "the conspicuous fleshy and woody fungi, the cup fungi and the genera containing parasitic species." There are nearly a thousand genera of fungi in America, and almost countless species—too many to be included in one Manual. The author has therefore begun with the Phycomycetes, giving keys by which the student may trace his plants to at least the orders or genera, accompanied by a general discussion of their relationships and references to the literature concerning them. Then follow, in the order named, the Ascomycetes, Fungi Imperfecti, Basidiomycetes and the Myxomycetes treated in like manner. In view of the attention at present paid to the edible fungi, the part of the book which treats of these is more elaborate. By its use the student should be able to distinguish the harmless species of mushrooms and other edible fungi. There are also chapters on the study of mycology, methods of collecting and preserving fungi, the relation of fungi to other plants, the reproduction, constituents and habits of fungi, etc. This is the first American book to bring together information of this character, and it is destined to have a wide circulation.

† "Moulds, Mildews and Mushrooms," a guide to the systematic study of the fungi and Mycetozoa and their literature. By Lucien Marcus Underwood. New York: Henry Holt & Co., 1899. 12 mo., 227 pp. \$1.25.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

The Second Meeting of the Chapter.

Seven years have passed since the Linnaean Fern Chapter was organized and during that time, although the membership has constantly increased, but two meetings have been held. The second of these was held at the New York Botanical Garden, New York City, on June 27th. President Maxon called the meeting to order at 1:30 p. m. Prof. L. M. Underwood delivered the address of welcome on behalf of the Garden authorities and this was responded to by the president who briefly sketched the Chapter's history.

Owing to the limited time for the reading of papers, it was decided that the papers of those who were not there to read them, be read by title, only. Accordingly Mr. Eaton's paper on "The Genus *Isoetes* in New England," Willard N. Clute's paper on "A Fern's Struggle for Existence in the Tropics," and the paper by Chas. T. Druery, F. L. S. on "Notes on the Boston Papers of 1898" were so read. These papers will appear in full in the Proceedings of the Meeting.

The first paper presented was by Miss Margaret Slosson, who delegated Mr. Maxon to read it. It was entitled "Experiments in Hybridizing Ferns." Mr. Davenport, commenting upon the paper, said that Miss Slosson is the first American to successfully experiment along this line. Mr. B. D. Gilbert followed with his paper on "*Athyrium* as a Genus," in which he gave his reasons for considering this a valid genus. Mr. Davenport also made brief comments on this paper. Mr. Percy Wilson's paper on the "Habit of the Ferns about New York City" mentioned the species he had found in the vicinity with localities for them.

Prof. Underwood's "Review of the Classification of Ferns as given in Engler-Prantl," criticised some of the German ideas of classification, but agreed with them in the main, especially as regards genera. The program concluded with Mr. William R. Maxon's paper on "The Occurrence of the Hartstongue in America," in which he mentioned all the known stations for the fern and gave an extensive bibliography of the subject.

—The new list of members shows one hundred and twelve names. There has never been a time in our history when the membership has decreased. All interested in ferns are invited to join.

50 cts. per Year.
15 cts. per Copy.

Vol. VIII.

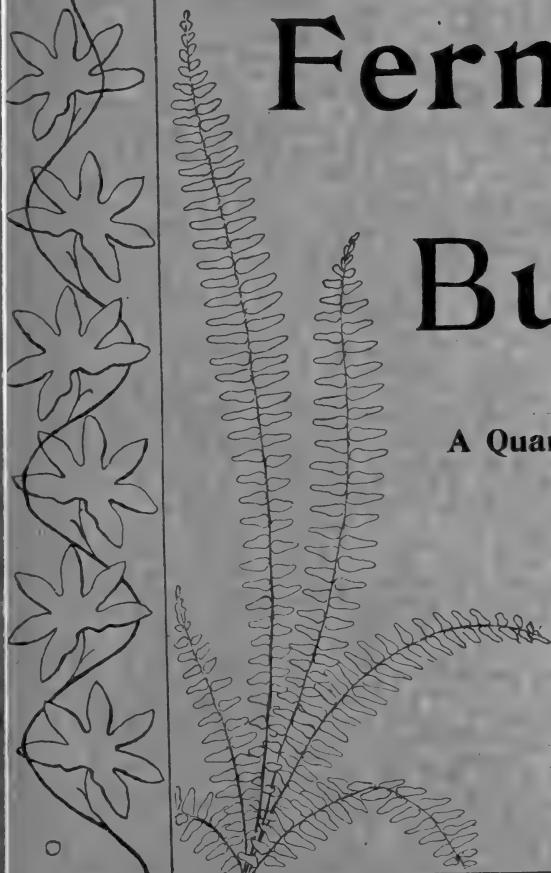
No. 4.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

OCTOBER.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1900.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

If this paragraph is marked, your subscription has expired. The mark indicates the time it expired as follows:

- x—With the previous volume.
- 1—With the present number.
- 2—With the January number.
- 3—With the April number.
- 4—With the July number.

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. Personal checks must contain ten cents extra for collection.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT, WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

BIND YOUR MAGAZINES!

We can furnish covers for **THE FERN BULLETIN** for 50c., or will put the volumes into permanent cloth binding for 75c. each, your choice of colors. All other work in proportion.

Send for estimates.

NEUMANN BROTHERS,

LIBRARY BOOKBINDERS,

7 East 16th Street, New York City.

"FERNS OF THE WEST" by Marcus E. Jones. This pamphlet was issued in 1882, and by many is supposed to be out of print. It is similar in scope to Dodge's "Ferns of New England." Contains descriptions of all the ferns west of the Mississippi River with keys for identification. Paper, 30 pages, 50c. postpaid.

Address THE FERN BULLETIN, Binghamton, N. Y.

NEED A TROWEL? Get a good one. The one we offer has an 8-inch solid steel blade that cannot break. It costs 40c., and will last a lifetime. Address THE FERN BULLETIN, Binghamton, N. Y.

FOR SALE—"Ferns of Iowa and their Allies," a 14-page descriptive pamphlet of interest to fern lovers. Only a few copies left. Price 10 cents. Address, T. J. Fitzpatrick, Iowa City, Iowa.

WANTED—To exchange sets of from 20 to 30 specimens of Eastern New York ferns, containing among others *Schizaea*, *Lygodium* and *Scolopendrium*, for an equal number from the Central, Southern or Western States. The Fern Bulletin, Binghamton, N. Y.

FOR SALE—About 100 sheets of Jamaica Ferns. Price, 10c. a sheet. For List, address Willard N. Clute, Binghamton, N. Y.





JOHN GOLDIE

THE FERN BULLETIN

VOL. VIII

OCTOBER, 1900.

No. 4.

JOHN GOLDIE.

BY WILLARD N. CLUTE.

THE history of American botany shows that the pioneers in the study found the road to knowledge anything but smooth. What with poor and uncertain means of communication, few and small libraries and no herbariums or botanical manuals, the pursuit of "the amiable science" must have been much less attractive than at present. But even those days were not lacking in men with sufficient patience, courage and energy to surmount every obstacle between them and their chosen study. They threaded the trackless wildernesses on foot and often alone, carrying their plants and other baggage on their backs and counting it good fortune if the cabin of some remote settler gave them an occasional night's shelter. Of this class of botanists was John Goldie, who explored parts of Canada and the United States early in the present century and of whom it is written: "Of a hardy constitution, fearless disposition, patient in his investigations, accurate in his judgments and with a fondness for his favorite science that no fatigue or discouragements could overcome, he is not unworthy of a place among those brave spirits of the Old World who became the pioneers of research in Canada."

John Goldie was born in the Parish of Kirkoswold, Ayrshire, Scotland, on the 21st of March, 1793. In his youth he served an apprenticeship as gardener and afterwards entered the Glasgow Botanic Gardens, where he received a thorough training in botany. In 1817, at the suggestion of Sir William Hooker, he took ship for America with the purpose of investigating the flora of the New World. As the vessel approached our shores, stress of weather drove her into Halifax. Here Goldie landed and wandered to northern New Brunswick and on to Quebec, carrying with him all the roots and specimens collected. During this trip he made many sketches of the scenery, with notes upon the geology and botany of the region. Upon reaching Quebec he placed this ma-

terial on a vessel bound for home, but had the disappointment of never hearing of it afterward.

He next visited Montreal, meeting Frederick Pursh, and then proceeded on foot to Albany, where he took a boat for New York. Later he explored parts of the New Jersey "barrens," of which he writes that "they present many rarities to the botanist and gave me more gratification than any part of America that I have ever seen." After a short stay in Philadelphia he returned to New York and again attempted to send a collection home. But this met the fate of the first one and never reached its destination.

At this juncture his lack of money obliged him to turn schoolmaster and the winter found him teaching in the Mohawk Valley. Quitting his place in the spring he went to Montreal, but failing to receive assistance promised by Pursh, was obliged to fall back upon his trade as gardener. At this he worked all summer with the exception of two days in each week which he devoted to botanizing. In autumn he once more attempted to send his plants home, but the vessel was wrecked in the St. Lawrence and everything lost.

Undaunted by these failures he again went to work and by the following June had amassed fifty dollars. With this, and a similar sum borrowed from a friend, he paid another visit to New York and then returning to Montreal, set out on foot for a journey to Niagara Falls, along Lake Erie, through New York and Pennsylvania to Pittsburg, up the Allegheny to Olean, thence to Onondaga, Kingston and Montreal. Here he packed up his plants and embarking on a vessel with them, at last got safely home. The diary which he kept on this journey was published in 1897 by his son, but the botanical journal, containing his notes and observations on the plants found, was destroyed by fire.

In 1824 Goldie was employed by the Russian government to assist in forming the botanical garden at St. Petersburg. Six years later he again visited Russia and was invited by the government to investigate and report on the flora of parts of that country, but he was obliged to decline because of business engagements at home. His American trip, however, had given him such a favorable opinion of the country that in 1844 he moved with his family to Ayr, Ontario, where he resided until his death in 1896, in the 94th year of his age.

John Goldie is best known to fern students through the dis-

covery of the magnificent *Aspidium* which bears his name, but the botany of flowering plants also is largely his debtor. His researches brought to light many new plants and it is likely that the list to his credit would have been much longer had his collections escaped destruction. During his residence in Canada he kept up a correspondence with many prominent botanists and published numerous articles in the *Edinburgh Philosophical Journal*. I am indebted to James Goldie, Esq., the son of John Goldie and himself a botanist and fern lover, for the material from which this sketch was prepared.

THE GENUS *EQUISETUM* WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON.

FIFTH PAPER.

E. TELMATEIA EHRRH.

RHIZOME dark brown, tuberiferous, clothed with cinnamon-colored felt, very slightly grooved, central cavity wanting, but large vallecular and small carnial ones present. Stems dimorphous; fertile, often clustered, 1-2 ft. tall, $\frac{1}{2}$ -1' in diameter, white, smooth, succulent, produced in early spring and soon perishing; lower internodes shorter than sheaths, upper often twice as long; sheaths slightly spreading at top; 1-2 in. long, membranous when dry, the leaves grooved in the center and stomatose on the edges, appearing 10-15 lobed by being connate in 2s and 3s; spike 2-3' long, an inch or less in diameter, consisting of about 40 verticils of sporophylls, each verticil with about as many sporophylls as the stem has ridges; sterile stems 6'-7 ft. tall, $\frac{1}{4}$ '- $\frac{3}{4}$ ' in diameter, white or pale green, naked below, smooth, without stomata; internodes 1-3 $\frac{1}{2}$ ' long; sheaths cylindrical, appressed, leaflets 10-40, narrow, 6-9" long; teeth half as long, with short, firm, grooved, subulate centers and broad, fuscous, hyaline margins and tips, usually adherent in groups.

Branches simple or rarely branched, without cavity, horizontal or ascending, in verticils of 20-40, light green, stomatose, 4-5 angled, keels deeply grooved and downwardly roughened with cross rows of toothed bands of silica; sheaths loose, 4-5 grooved, the keels sulcate on the back, the commisural grooves lighter, hyaline teeth short, erect; dried specimens marked with light

paraboli cal bands, through regular graduation of branch sheaths.

This is the typical plant, found from 38°–55° N. lat. and from Ireland through Germany to the southern Urals, Persia, and North Africa. Ascribed to the Great Lakes and Pacific Coast by Milde, the former through error. All the American specimens examined have proven to be varieties, and it is safe to assume the type is not represented here.

When we consider that the life of the spores is but a few days, so that it is impossible to get them in a living condition from the Pacific slope, the question of the peculiar distribution is an interesting one. With ferns we might suppose the wind carried the spores, but with *Equiseta* the chances against a ten-mile trip, with male and female spores alighting near enough for fertilization, are almost infinitesimal. As the American plant has developed in special lines we should suppose long periods of time to have elapsed since the separation, and we may well suppose it to have been in glacial times, when so many plants were exterminated over large areas. We thus have a measure of the progress of species-making, and find that in this genus it is extremely slow. The presence of stomata on the leaves of the fertile stems and their absence on the internodes would indicate that the present habit of *Equiseta*, where the leaves are mere appendages and the branches stomatose and chlorophyllose, is a case of degeneration. I find no mention of these stomata by any author save Buysson (Mon. *Equis. d'Eu.*) I have seen none on the European plants examined, but they are plentiful on the American. The branches of the European plant often bear secondary branchlets; a condition which does not obtain in this country, so far as available material, ranging from British Columbia to San Diego, shows.

VARIETIES.

1. *Braunii* Milde. Sterile stems roughish, more deeply grooved than in the type, light green, bearing a double row of stomata on each side of the hollows. Branches 4–6 angled. A cross-section of the stem shows a small fleck of green parenchyma under each row of stomata. This has been found in Scotland, but not elsewhere save in America, where it appears to displace the type, being distributed along the Pacific coast line from Santa Catalina Island (Trask), and San Bernardino, Cal., (Parish), to British Columbia, where it is abundant about Victoria (Henry),

and New Westminster (Hill), covering seventeen degrees of latitude, from 33° – 50° ,

The type collected at San Francisco was 2–3 ft. high with internodes 2.5' long, sheaths with twenty teeth. Mr. A. J. Hill has sent me specimens from New Westminster, B. C., seven feet tall, with 40 internodes, some of which are 4' long, stem $\frac{3}{4}$ ' in diameter with the upper two thirds covered with verticils of horizontal branches, which are often 16' long. The lower third is naked, the sheaths with only two-thirds as many teeth as are seen in the upper ones.

The absence of stomata in the European and their presence in the American plants has its analogy in *Isoetes Echinospora* Dur. It is a curious coincidence that the variety *Braunii* is based on this fact in both instances.

2. *Hillii* var. nov. Stems 10–15' tall comparatively slender, light green, stomatose, thickly branched from the base; internodes short, 1'–1.5' long, distinctly grooved; sheaths short, appressed, light green, with fifteen to twenty very distinct leaflets, each with a deep carnial groove and a shallow secondary groove on each side, thus becoming 4 angled; teeth short, firm, dark brown, separate, narrow, filiform-subulate, without membranous borders except at base; branches many, 5–8' long, over half the length of the stem, the lower erect or spreading, the upper ascending or horizontal, often arched above the middle, the tips drooping, usually overtopped 4–6' by the filiform branch-like apex of the stem. They are simple, with distinct central cavity equalling the vallecular in size, and are 5–6 angled, each keel deeply concave. This has the aspect of *E. arvense boreale*, except its basal branches. Wet sides of a ravine, New Westminster, B. C., Nov. 1, 1899, A. J. Hill

A very distinct variety, peculiar in its 4 angled leaves, its distinct teeth, its long branches from the base, up, and especially in its possession of a centrum in the 5–6 angled branches. Type in Chapter Herbarium, A. A. Eaton Herbarium, U. S. Nat. Museum, and several sets. Duplicate types will be furnished the remainder.

3. *Gracile* Milde. Stems several, caespitose, erect, pale green, 7–15 angled, roughish, stomatose, conspicuously grooved, branched from the base, internodes 6–12', branches 4–5 angled, 2–6' long, stem angles broad, deeply concave, as broad as the valleculae; centrum and vellecular cavities about equal; bast none.

The stems are clustered around the basal internodes of an abortive stem, and are really transformed branches. The typical plant appears to be about a foot long, very slender, with sparse short branches from basal internodes, naked above. From this the shoots may be $\frac{1}{4}$ ' in diameter with dense verticils of long branches from the base. Usually found in cultivated fields. Type European, seen only from British Columbia (Hill).

4. *Breve* Milde. Stems 6-12' long, erect, internodes shortened, with fastigate spreading branches. A dwarf form in dry soil.

5. *Serotinum* A. Br. Ordinary sterile stems bearing spikes. Of two forms analogous to *E. arvense campestre*. a. *Macrostachya* Milde. Spikes of the same size and appearance as on the normal fertile stems. Only two American specimens seen, both from British Columbia. b. *Microstachya* Milde. With comparatively small spikes; a transformed sterile stem. I have seen no American specimens of this. Moore (Handb. Brit. Ferns) says this is caused by drouth and is most common in August.

Besides the foregoing, there are many other European varieties, including *frondescens*, analogous to *E. arvense irriguum*, and *prolifera*, small spikes ending in sterile branch,

[Owing to lack of sufficient material, distribution cannot be made at once. Material for other papers is ready and it is now hoped to continue these papers uninterrupted until they are finished.]

FERNS OF SOUTHEASTERN OHIO.

BY MRS JOSEPH D. TAYLOR.

THE list of ferns found near my home is not, perhaps, so extensive as some of those already given in THE FERN BULLETIN, but the pleasure derived from "Dorset Ferns" and "Ferns of Scolopendrium Lake" leads me to believe it may not be without interest to fern-lovers. My favorite ride is along a road that for some distance follows the windings of a creek, passes through three stretches of woodland, ending at a veritable brook, and, although my botanical excursions have extended in other directions, I find nearly all of our common ferns along this road.

The first fern to greet me after leaving city limits is the Christmas fern (*Dryopteris acrostichoides*). It lifts its shining leaves here and there along the roadside in a sturdy way that is quite refreshing. I sometimes think I like this fern better than any other, not because of its delicacy but for its strength; and then, it is an evergreen and to a transplanted New England woman who revelled as a child among delightful clumps of pine and spruce and hemlock, evergreens have an especial charm.

A little further along this road, nestled at the foot of a broad-spreading beech tree, growing amid the leaves and scarlet berries of the partridge vine, we find the Maiden-hair (*Adiantum pedatum*). Just here the road descends. Nearer the creek we come upon great patches of the Sensitive fern (*Onoclea sensibilis*), and what I suppose to be the Marsh Shield-fern. This fern does not, in all respects, closely resemble the Marsh Shield-fern I find in New England, being stouter and decidedly hairy, but it is surely a *Dryopteris* and answers that description more nearly than any other I find in my "Manual," so I call it *Thelypteris* and place a mental interrogation point after it.

We cross a bridge. On one side of our road is a steep hillside. In such a "coigne of vantage" in New England one would be sure to find the Sweet Pasture fern and the brake, but I have never found *Dicksonia punctilobula* in this part of Ohio, and *Pteris aquilina* is not common. Half way up this hill there is a spring, a grateful watering place in the edge of the woods. I have found here two or three fronds of the brake every season for years, but they are always small and look like immature plants. I have occasionally seen this fern in other places about here, but very seldom. Not long ago I was invited by a friend to look at a rare "tree-fern," transplanted to her garden with the greatest care. I knew, of course, it could not be a "tree-fern," but my surprise can be imagined when I found her treasure to be our common New England "brake."

Leaving the hillside, we next came to a stretch of rather open woodland and find along the roadside, in addition to the ferns already mentioned, the black shining stipes of the Ebony fern (*Asplenium ebeneum*). Over the fence, a little further in the woods, Moonwort (*Botrychium Virginianum*) grows in great abundance. On the shaded roadside near, we find the Beech fern. When I came to recognize this genus I read in some botany that *Phegopteris hexagonoptera* was often to be found

in company with its northern relative, *Phegopteris polypodioides*, so common in Maine woods. Long, earnestly but unavailingly did I search for this broad-leaved Beech fern. In this part of Ohio it is the prevailing species, and so far as I have been able to ascertain, the only one. Growing in this shady spot are beautiful specimens of the Lady fern (*Asplenium filix-femina*), the graceful fronds of the smaller Bladder fern (*Cystopteris fragilis*), and Maiden-hair, in the greatest abundance. It is at this particular place I fill a big tin box with ferns for decorative household purposes. One can take away whole armfuls and not feel she is robbing the hillside. We are now near the brook and find in the lower ground clumps of *Osmunda Claytoniana*. This brook is a delight to my eyes and a joy to my heart from early spring until cold weather and Ohio mud combine to shorten my daily ride. On the steep hillside above, there is always a tangle of beautiful woody things. I feel tempted to mention some of these floral treasures but fear, if I once begin, I shall forget I am writing for THE FERN BULLETIN, so I will only say that to our fern list we add the silvery Spleenwort (*Asplenium Thelypteroides*)—beautiful ferns they are—the narrow-leaved Spleenwort (*Asplenium angustifolium*), and *Dryopteris marginalis*.

There is no law, written or unwritten, decreeing that this beautiful spot shall be the limit of my daily ride, but by the time I have reached and explored this ever-changing "wild garden," botany boxes and all available carriage space are usually filled to overflowing. One day, upon extending my ride a little, I came to a hill where great gray rocks could be seen in the edge of the woods. Large rocks are by no means common in this part of the country and like evergreens (perhaps from early association), are to me particularly inviting. Closer investigation showed some of these rocks to be covered with Walking fern (*Camptosorus rhizophyllus*), the beautiful Maiden-hair Spleenwort (*Asplenium trichomanes*), and the Rock fern (*Polypodium vulgare*), while very near grew *Dryopteris spinulosum*, probably variety *intermedium*, although I confess that varieties of *spinulosum* are often marked by the interrogation point previously mentioned.

The twenty species which I have mentioned do not include possible findings, but ferns actually gathered at or very near the roadside within a distance of two or three miles. I do not think

this station can claim first rank, either as regards number or abundance of species, but beauty is all about us, standing, as it were

“With arms outstretched and eager face ablaze,
Yearning to be but understood and loved.”

Cambridge, Ohio.

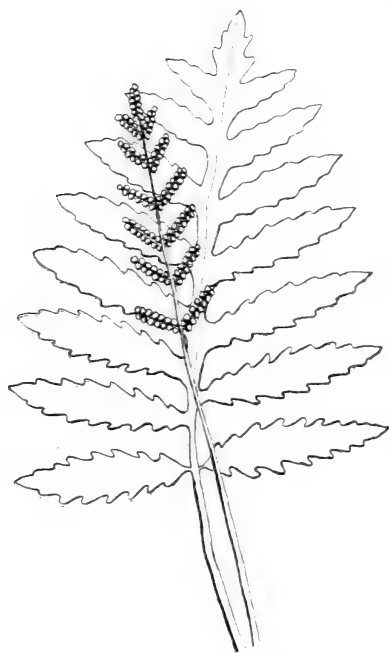
HELPS FOR THE BEGINNER.

II.—THE SENSITIVE FERN.

WHOEVER has crossed a swampy meadow, or boated and botanized on the streams in the territory east of the Mississippi river has doubtless seen the Sensitive fern (*Onoclea sensibilis*), although he may not have recognized it as

such. It is a rank species with broad coarse leaves that scarcely look like those of a fern and which are not in the least sensitive. It is exceedingly common in all wet places, and no one should have trouble in finding specimens.

The fertile fronds are very different from the sterile. Instead of being flat and green, they are tightly rolled round the sori, each lobe of the frond forming a small berry-like object like those in our illustration. They do not appear until rather late in the season, so late, in fact, that it does not seem advantageous for them to shed their spores until the next spring. They are held fast above the snow all winter and liberated



Onoclea sensibilis, a fertile and sterile frond.

when the soil is suitable for their germination. These fruiting

fronds are very characteristic objects in the winter landscape and at any time of year may be depended upon to identify the plant, for none of our other ferns have fronds like them.

There has been a great deal of discussion regarding the origin of the common name. Some say that the sterile fronds are so sensitive that they will at once wither when growing, if touched by the hand; others, that the pinnæ will slowly come together if the stem is squeezed; and still others are of the opinion that the name was given because it withers so soon after being cut, or because it is sensitive to autumn, frosts. The latter is likely to be the correct explanation, but the beginner should experiment for himself. This is also sometimes called the Oak-leaved fern.

The word *Onoclea* is said to be derived from two Greek words meaning a vessel and to close, in allusion to the tightly rolled pinnules of the fertile frond. The sori are round and covered with a very thin indusium which is fixed to the frond by the lower side. Probably very few students have ever examined this, since it is so easy to identify the plant without referring to it.

A form is occasionally found with fronds half-way between fertile and sterile. This is the so-called variety *obtusilobata* and may be produced by destroying the sterile fronds early in the season. The half-formed fertile fronds are thus obliged to take the places of sterile ones, with the result of making a frond that is like neither. The Sensitive fern is the only species in the genus.—*W. N. C.*

[This series was begun in the number for July, 1900, and will be continued until all our eastern ferns have been discussed.]

GRAPE FERNS AT MOUNT ARARAT, PENNA.

BY C. F. SAUNDERS.

IF we except *Botrychium Virginianum*, which is apt to be found in almost any rich woodland of our Eastern States, none of the American species of the so-called Grape Ferns would seem to be common plants, and the discovery of one of them in a new locality is sure to be the occasion of a special pleasure to any but a very jaded collector. It was, therefore, something of a red-letter day to the present writer when early in July, last, he happened upon two of the rarer species (*B. lanceolatum* and *B. matricaræfolium*) growing together and in

profusion at Ararat Summit in northeastern Pennsylvania. The locality was a damp, deciduous wood, at an altitude of about 2,100 feet, and if a special convention of Fern Allies should ever be called for that place, the local reception committee would be a respectable one. Besides the two species just named, there were there, *B. Virginianum*, *B. ternatum* (just appearing, the special form not then distinguishable), *Lycopodium clavatum*, *L. lucidulum*, *L. obscurum*, *L. annotinum*, and *L. complanatum*; while in the immediate neighborhood, within calling distance, so to speak, were *Equisetum sylvaticum*, *E. arvense*, and *E. fluviatile*, to say nothing of *Isoetes echinospora Braunii* abundant in ponds three or four miles away.

The floor of the wood referred to was deep with the undisturbed leaf mould of many years, and was everywhere humped in short, low ridges or hummocks. It was in the damp, rich depressions between these hummocks that *B. lanceolatum* and *B. matricariaefolium* were invariably found. Diligent search on the part of myself and of Mr. Clute, with whose company I was favored upon the occasion of a visit to the wood a few days later, failed to reveal a single plant of either growing upon the hummocks, except an occasional one near the base. Both species were very sociable, plants of each often growing side by side and sometimes sharing the same bit of old brown leaf to push up through.

In size, *B. lanceolatum* was found varying from about two inches to six and a half, the sterile leaf very regular in its triangularity, and the fertile portion usually profusely branched. *C. matricariaefolium*, which was the more abundant species there, grew from four inches to ten or eleven in height, the larger plants as fleshy as aldermen. It was noticeable that the sterile leaves of this latter species were quite variable in form—some being lanceolate in outline with roundish divisions barely toothed, while others were ovate in outline with long, slender deeply cut divisions; some were forked at the apex. The fertile spikes of this species were noted as usually almost simple, or at most very sparingly branched, and their sporangia at the time of our visit had burst open and become brown. The sporangia of *B. lanceolatum*, on the other hand, were still green and unopened.

The low stature of these Botrychiums and the small expanse of surface of the one leaf that each plant bears, make them

difficult of detection, even when abundant, in the leafy mould they delight to grow in. They may, therefore, yet reward patient search in many localities heretofore supposed to be barren of them.

Philadelphia.

NOTES ON AMERICAN FERNS: III.*

BY WILLIAM R. MAXON.

TRICHOMANES PETERSII A. Gray. This rare fern has figured so slightly in literature that, in giving an account of its re-discovery by Mr. Charles L. Pollard and myself, at an almost unknown station last summer, I shall recapitulate the main facts in its history. It was described by Dr. Gray† from specimens sent to him by Judge Thos. M. Peters, collected January 8th, 1853, in "Hancock (now Winston) county, Alabama, not far from the Sipsey river; found only on the face of an isolated sandstone rock within the reach of the spray of a waterfall which is supplied most of the season." Specimens collected at various dates by Judge Peters were distributed to the principal herbaria; but aside from these, I think the fern has been only once collected at the type locality, viz: by Professor L. M. Underwood, on June 1st, 1896. After continued search he finally found it "creeping under the roof of shelving rocks" near the Sipsey river, T. 8, R. 9, Sect. 10, Winston county, but at some distance from any falling water.‡

The National Herbarium contains specimens collected by Dr. Charles Mohr in 1880, at Black Creek Falls, near Gadsden, Etowah county, Alabama. Upon July 29th last, Mr. Pollard and myself, after a most painstaking search, succeeded in re-discovering the fern at this station, concerning which nothing has previously been made known. Unlike the situation described by Professor Underwood, our plants grew in considerable moisture, on the sloping sides of wet sandstone rocks at the base of dripping cliffs. They were apparently limited to a single small stretch a few feet in extent, and grew partly in thick mats (as described by Judge Peters), but commonly forming only a sparse network of creeping stems, as in Professor Underwood's

*Published by permission of the Secretary of the Smithsonian Institution.

†Am. Jour. Sci. and Arts (2d Series) 15: 326. 1853.

‡Bot. Gaz. 22: 412. 1896.

plants. The mats seemed to represent merely the older portions of the growth.

The fern has been reported from still one other station in Alabama, by Dr. E. A. Smith, State Geologist, who records it from the "rock houses" at Pikeville, Marion county.* Marion county adjoins Winston, and is largely of the same formation. Aside from the bare location I think nothing is known of the fern in that situation. It will be surprising if it is not subsequently reported from many more situations like these—sandstones capping the coal measures—in both Tennessee and Alabama.

A SECOND EASTERN RECORD FOR *PELLÆA Densa*.—Aside from the station known for this fern at Mt. Albert, Gaspé, Quebec, I believe it has not been known to exist east of the Rockies. I have recently learned, through an examination of specimens kindly forwarded by Dr. H. M. Ami, of the Geological Survey of Canada, of its occurrence in Ontario, where it was collected by Dr. Ami, in 1883, on guelph dolomites along the Little Sau river, near Durham, Grey county. Its companion plants were *Phyllitis scolopendrium* and *Pellæa atropurpurea*.

Washington, D. C.

LYCOPodium INUNDATUM.

By WILLARD N. CLUTE.

WHILE collecting in the eastern part of Broome County in southern New York, last summer, I was so fortunate as to find a thriving colony of the rare little club-moss, *Lycopodium inundatum*. This species is rather northern in its distribution. Our station appears to be near the southern limits of its range and at a much lower altitude than most of the stations for it further south. It is not uncommon in the New England States except in Connecticut and Rhode Island, and has been collected once in New Jersey, and three times in Pennsylvania, so far as known.

About three miles east of East Windsor, in the Susquehanna Valley, and some hundreds of feet higher than the river is a small sheet of water known as Marsh Pond. Its name is exactly descriptive. The shores are so boggy on all sides that only here and there can one approach the water. These boggy places con-

*Geol. Surv. Ala. Rept. for 1881-2, on Agric. Features, etc., p. 438. 1883. I am indebted to Dr. Mohr for calling my attention to this reference.

sist of a tangle of leather-leaf, pale laurel, sphagnum and other semi-aquatic vegetation which form a thin crust, often less than a foot thick, over bottomless mud. Walking over this surface is something of a hazardous undertaking. At every step it trembles and sinks as if about to give way and an incautious move may cause one to drop out of sight forever.

The plants were found growing in a more open place in the midst of this tangle, at first hardly to be distinguished from the sphagnum by which they were surrounded. As the eye became more accustomed to singling out the specimens, they appeared to be plentiful, the erect fruiting part being most noticeable. In appearance they are nearest to *L. Carolinianum* and are scarcely taller. The sterile part, however, does not cling so closely to the earth, but usually rises slightly at base and describes a short semi circle downward. The fruiting spikes are also more robust and leafy. Full grown spikes, however, are often barely an inch high with sterile portion scarcely longer. In large plants the sterile part is frequently branched once or twice.

South of our plant's range there grows a species which is often mistaken for it, but the two are not likely to be confused by those who have collected both. The southern one is a taller and heavier plant and is the one recently named *L. adpressum*.

A FERN ENEMY.

BY SADIE F. PRICE.

THOUGH the purpose of THE FERN BULLETIN is more in the interest of the anatomy and ecology of the fern rather than its cultivation, yet the experience of a friend while combatting a fern enemy seems to me to be of sufficient interest to deserve mention.

Mrs. Julia M. Hunter, 62 W. 93d St., New York, who had fine plants of *A. filix-foemina* and greenhouse ferns in her bay-window, found them suffering from some unknown cause. Investigation showed that the roots were infested with an insect that on more careful study proved to be the podurid. All efforts to exterminate the pest resulted in failure. A solution of tobacco only served to stupefy them for a time. The insect without doubt feeds on cryptogamous plants as well as the waste in the soil. The plants were transplanted into fresh soil, the roots carefully washed and sprayed with tobacco water. A five-inch flower pot

was placed in the tub of ferns and then removed, leaving a depression in the soil, "a swimming place for the podurids," so that she could watch the effects of anything applied to destroy them. "The athletic exhibitions of internal energy by leaps into space when laid on a plate for examination, are surprising." She was advised to use hot water. This no doubt killed the insect, but it also killed the ferns. The problem of what will destroy the podurid and not the plant still remains unsolved. She further writes: "I have to content myself with the knowledge I have gotten that these almost microscopic creatures are the ancestors of all land animals, according to Packard. Ergo, our ancestors! If now I order a fern I request that the soil be baked and boiling water poured through it several times, ere it receives the plant."

[The FERN BULLETIN desires to be of the greatest service to all lovers of ferns and will be pleased to publish such notes on the cultivation and care of ferns as are contributed. Those who labor in the fern garden should not let the devotees of the herbarium have all the honors.—ED.]

DRYOPTERIS VS. LASTREA.

BY CHAS. T. DRUERY, F. L. S., V. M. H.

I HAVE read Professor Underwood's defense of *Dryopteris* with much interest. Truth to tell, my objection is not based on research into origin of names, but on the consideration that when such high authorities as Kew and such practical ones as the majority of fern growers have adopted *Aspidium*, *Nephrodium* and *Lastrea*, it is a pity to insist upon a fourth synonym and thus to increase the confusion. I am confirmed in this view all the more strongly as I find that Professor Underwood's authority, Adanson, was evidently in this case as indefinite in his classification as many of his successors.

Dryopteris, if synonymous with *Lastrea* or *Nephrodium*, has *not* an "*enveloppe enparasol*," but a distinctly reniform indusium; the "*enveloppe enparasol*" or truly peltate indusium is a characteristic of the very different tribe of *Polystichum*. Hence Adanson in coupling Tournefort's figure of *Filix-mas* with his definition of *Dryopteris* is distinctly wrong and a fundamental reason for using his synonym falls away. Consequently "if," as Professor Underwood states, "all the ferns with a superior umbrella-like indusium and roundish sori are to be included in one genus," and "that genus by the law of priority

must bear the name of *Dryopteris*," then all ferns with a distinctly reniform indusium, i. e., *Nephrodium* or *Lastrea*, are outside this genus and should not be saddled with a name which does not belong to them and was never tenable when given as now in this connection.

Binding the "Bulletin."

Correspondence with our subscribers has shown that nearly all preserve their copies of THE FERN BULLETIN and that a large number put them into permanent binding at the end of each year. For the convenience of those who intend to have their copies bound, it may be stated that Messrs. Neumann Brothers, of New York, make a specialty of binding this journal and turn out very handsome volumes. They have bound our own copies in gray cloth with gold lettering on back and sides in a most satisfactory manner. The great advantage in having the journal bound by this firm is that no matter when bound, the volumes will be alike in style and appearance.

A neat and inexpensive method of binding for those who do not care to patronize bookbinders, is by means of the "klips" manufactured for that purpose. All that is needed to turn the numbers into a serviceable volume in ten seconds, is a pair of klips and a cover of manilla. The klips do not injure the magazines in the least and while holding them securely, permits of their being separated again as quickly if desired. The klips cost five cents each, a pair of keys which will open any number of klips costs ten cents and a sheet of manilla that will make several covers can be purchased at any paper store for a few cents.

It will probably be found best to bind the first three volumes in one, and make separate volumes of the rest. Those who would economize in the cost of binding may find it convenient to bind the first four volumes in one, the next two in one, and make subsequent volumes the size of the latter.—*Willard N. Clute.*

Although all the species of *Isoetes* are perennial, only a small portion of the plant persists from year to year. The roots, the leaves and the bulky cortex are shed or decay annually, and are as often renewed from the stem, apex and the meristematic zone which surrounds the small central permanent cylinder.—*R. W. Smith in Botanical Gazette.*

A LIST OF THE FERNWORTS COLLECTED IN JAMAICA*

BY WILLARD N. CLUTE.

(Continued.)

TRICHOMANES Sm.

18. *T. sphenoides* Kze. Found growing in little mats on wet rocks above Moore Town. A very small and irregularly cut species. (263).
19. *T. Kraussii* Hook. & Grev. Abundant on trees and rocks above Moore Town, forming dense patches. (271).
20. *T. membranaceum* L. On wet rocks, Cuna Cuna Pass, not common. The fronds of this species are generally semi-circular in outline. (294).
21. *T. muscoides* Sw. On trunks at Moore Town. Apparently not common. (281).
22. *T. crispum* L. Most abundant at high altitudes, growing on the forest floor. One of the largest Jamaican species. Collected at John Crow Peak and Morce's Gap. (47).
23. *T. lucens* Sw. New Haven Gap, on trunks. This has considerable resemblance to *T. crinitum*, and, being confused with it, but one specimen was collected. (119).
24. *T. crinitum* Sw. One of the handsomest of the Jamaican filmy ferns. It grows in circular tufts at the base of trees. Morce's Gap, not very common. Fronds light yellow-green, pellucid. (53).
25. *T. alatum* Sw. New Haven Gap. This also much resembles *crinitum*. (76).
26. *T. trichodeum* Sw. An interesting species found in the forests of tree ferns, where it grows on the trunks of *Cyathea pubescens*, and is seldom found elsewhere. The final divisions of the fronds are not wider than pencil marks. Morce's Gap and elsewhere. Common. (52).
27. *T. scandens* L. Climbing on trees by means of the running rootstock. Moore Town. Easily mistaken for *T. radicans*. (74).
28. *T. radicans* Sw. Common at nearly all altitudes, climbing over trunks and rocks. (59).

* Begun in the number for July, 1900.

29. *T. rigidum* Sw. Abundant on the forest floor at considerable elevations. An exceedingly stiff species, curling back to its original form as soon as the pressure is removed from it, although perfectly dry. (46).

SCHIZÆACEÆ.

ANEMIA Sw.

30. *A. hirta* Sw. Along roadsides in moist soil. Cedar Valley, not common. (167).
31. *A. hirsuta* Sw. Abundant along roadsides in the driest situations. Collected at Gordon Town and elsewhere. (39).
32. *A. adiantifolia* Sw. Very abundant along roadsides and on rocky banks. (166).

LYGODIUM Sw.

33. *L. volubile* Sw. Mansfield. This plant climbs to the height of thirty feet or more, the stems giving off frequent branches which form thick tangles over trees and bushes. With this was collected a form with narrow, tapering, acute pinnules, the fertile ones with the sori borne on the inner two-thirds, in longer marginal spikelets than in the normal form. It appears to connect this species with *L. venustum*, also of Jamaica. I would call it variety *angustum*. (282).

GLEICHENIACEÆ.

GLEICHENIA Sm.

34. *G. pubescens* H. B. K. Abundant in open dryish places. Cinchona. (177).
35. *G. furcata* Spreng. Common with the preceding. (184).
36. *G. pectinata* Pr. Common in the lower hills, often covering the ground for many acres. Port Antonio and Cedar Valley. (154).
37. *G. dichotoma* Willd. On open banks. Cinchona, abundant. (183).
38. *G. Bancroftii* Hook. Along woodland trails. Cinchona, common. (180).

(To be continued.)

—*Dicksonia pilosiuscula* is noted for producing rhizomes from the base of the stipe, but many other ferns have the same habit. Among those of America may be named, *Pteris aquilina*, *Aspidium filix-mas*, *Onoclea struthiopteris* and *Acrostichum aureum*.

OUR MISCELLANY.

I notice that in my article in the January number of the FERN BULLETIN I inadvertently made the name of a fern described, *Dryopteris spinulosa glandulosa*. Of course it should have been *Dryopteris dilatata spinulosa*. Force of habit, I suppose, made me write it the other way.—B. D. Gilbert.

Marsilia quadrifolia is quite common on the Concord river from Concord through Bedford, Carlisle and Billerica, and almost to Lowell. It was sent from the Cambridge Botanic Garden and planted in Concord by Mr. Minot Pratt, and has gradually worked down the river and now may be found in abundance. It grows from 3 to 4 inches to 3 to 4 feet in length.—C. W. Jenks.

Among our native ferns of larger growth, one of the noblest is *Dryopteris cristata Clintoniana*. This is a striking form which one would be apt at first glance to associate with *D. Goldiana* rather than with *D. cristata*, because of its generous size and a certain indescribable dignity of bearing, if one may use this expression in speaking of a plant. The writer of this paragraph still recalls with pleasure the finding of it in perfection last summer in a wooded mountain swamp in Pennsylvania, where it luxuriated in the black muck amid the moss-grown boles of fallen forest giants. Companions, of its own kith and kin, were *D. cristata*, *D. Boottii*, *D. spinulosa intermedia*, *Onoclea sensibilis* and the *Osmundas*.—S.

I heard a local name of a fern this summer, while in the wilds, that interested me. There were three small plants of *Botrychium Virginianum* growing on a hillside. A country girl with me said, "That's 'sang-sign,' and points to a 'sang' plant." I saw she followed one that was pointing down hill—a sensible thing to do—so I followed the second frond, whose apex was pointing down hill. By a strange coincidence we found a ginseng plant not ten feet away. The ginseng is not common there; but of course is likely to be found where *B. Virginianum* is found. I tried to deceive her after that with any triangular fern such as *Botrychium ternatum* or *Phegopteris hexagonoptera*, but she could always distinguish the "sang-sign."—S. F. Price, Bowling Green, Ky.

[In Virginia and further south this fern is called "Indicator," from its supposed power to indicate ginseng. The base for this curious idea is probably as Miss Price suggests, that the two plants love the same situations.—ED.]

EDITORIAL.

WANTED

We would remind our readers that short notes on ferns are especially desired. It is a good time to send them in when you are renewing your subscription, but you need not wait for that. What have you learned of interest about ferns during your summer's work? Only the few can discover new species, but we all can discover new facts. Indeed, it may be set down as a rule, that if we do not find out something new, constantly, we are not progressing.

* *

WHO

KNOWS ?

There are two well marked forms of the Walking fern made by the shape of the leaf. In one the basal ears are rounded; in the other they are prolonged somewhat like the tip. Are both forms present in your locality? Which is the more common? Do the two ever grow from the same rootstock? This species is known to grow on gneiss, granite, quartzite, sandstone and shale, as well as limestone. Does soil make a difference in the shape? Has this fern ever been reported as growing on other rocks than those mentioned? Who can answer?

* *

AS TO

VARIETIES

The recent publication of names for several varieties which are admitted to be merely individual departures from the normal, has shown that we stand in real need of some style in nomenclature that will distinguish these from the true varieties, or more properly, sub species. We indicate a species by writing two names, generic and specific as *Polypodium vulgare*; a sub-species by three names, as *Aspidium spinulosum intermedium*, or *Botrychium obliquum dissectum*; but for the third class we still need a proper designation. To write them as we would the names of sub-species would be most confusing to the student who does not know the true character of each. *Osmunda cinnamomea frondosa* does not stand for the same type of plant (with definite form, habit and range) that *Aspidium cristatum Clintonianum* does. How, then, shall we distinguish between the two in writing? It has been suggested that those which do not have a definite range and do not reproduce themselves naturally, be always written with *variety* preceding the third name, as *Onoclea sensibilis* var. *obtusilobata*. We would like the opinion of others on the subject.

NOTES.

—The leading article in *Rhodora* for September, is entitled, "Ferns of Alstead, New Hampshire." It consists of notes on about thirty of the commoner ferns.

—A new *Botrichium*—*B. pumicola*—is described in the recently issued sixth edition of Underwood's "Our Native Ferns," by Mr. F. V. Coville. It was found at Crater Lake, Oregon, in pumice soil and is nearly allied to *B. tenebrosum* and *B. simplex*.

—Mr. L. F. Henderson has described a new species of *Isoetes* from Idaho, in the *Bulletin of the Torrey Botanical Club* for June, under the name of *I. occidentalis*. It grows a foot or more under water and is closely related to *I. lacustris*—"perhaps too near for specific delimitation"—the author says. It is reported to be common in many lakes of the Northwest. In the same place is described a variety of *I. Bolanderi* which is named *Sonnei*. It was collected in Donner Lake, California.

—The North American species of *Lycopodium* have recently received attention at the hands of Professors L. M. Underwood and F. E. Lloyd, whose conclusions, published in the *Bulletin of the Torrey Botanical Club* for April, show several more species added to the number within our limits, bringing the total up to seventeen. The ranges of those already known are also more clearly defined. *Lycopodium porophyllum*, very near *L. lucidulum*, is described as new and credited to stations in Wisconsin, Indiana, Kentucky and Alabama. Two forms that were once considered as varieties of *L. inundatum* are raised to specific rank as *L. adpressum* and *L. pinnatum*. Of the former the authors say: "It must be admitted that from the true boreal species, *L. inundatum*, to the large southern *L. adpressum*, there are many forms which, on account of variations in size of stem, denticulation and variation in the size and shape of leaf and sporophyll, are difficult to place." To the latter variety is apparently referred the plant recorded from Plum Island, off the coast of Massachusetts, as *L. alopecuroides*. Of true *alopecuroides*, the farthest northern specimens were found by the editor of this journal in 1898 at Babylon, Long Island. *L. Stichenense*, a plant of the Northwest, related to *L. sabinæfolium*, is recorded as occurring in Maine, Labrador, New York and Ontario. A species from Jamaica allied to *L. complanatum* is named in honor of Hon. William Fawcett, Director of the Public Gardens of Jamaica.

BOOK NEWS.

The sixth edition of "Our Native Ferns,"* just issued, is almost identical in arrangement and appearance with the earlier editions, but fern students will find it of special interest from the fact that the text has been extensively revised. The result, however, will scarcely please those who take a conservative position upon the question of nomenclature. Former editions have recognized twenty-four genera of North American ferns, the present one shows thirty-two. The additional genera have been made by elevating to higher rank what were formerly considered sections of other genera. These changes and the substitution of older names for others, involves the changing of either the generic or specific names in no less than fifteen of these genera. We now have *Ornithopteris* for *Anemia*, *Gymnopteris* for *Gymnogramma*, *Cheilogramma* for *Tænitis*, *Struthiopteris* for *Lomaria*, *Metteuccia* for *Struthiopteris*, *Filix* for *Cystopteris*, *Dennstedtia* for *Dicksonia*, and *Phymatodes*, *phlebodium* and *Campyloneuron* for parts of *Polypodium*. For sections of other genera, we have *Cheiroglossa*, *Pteridium*, *Polystichum*, *Phanerophlebia*, and *Tectaria*. In specific names are noted, *Botrichium neglectum* for *B. matrieariaefolium*, *Adiantum Jordani* for *A. emarginatum*, *Polystichum Lemmoni* for *Dryopteris* or *Aspidium Mohroides*, and *Selaginella bryoides* for *S. cinerascens*. The little rock fern which was once a *Pteris* and later a *Pellaea*, is at present resting as *Cryptogramma Stelleri*. In making changes in generic names Prof. Underwood has simply been guided by the latest rules of nomenclature. These were formulated to enable us to have something like stability, but the end does not seem to have been attained. The making of new genera is mostly a matter of opinion. Fern students pretty generally favor *Polystichum* for the *Aspidiums* with peltate indusia, but many will consider the others an over refinement. In the matter of range the author seems to have overlooked several important extensions, such as *Adiantum capillus-veneris* in Dakota, *Asplenium viride* in the Northwestern States, and *Woodwardia radicans* in Washington. *Dryopteris simulata* is recorded from New Hampshire and Massachusetts only, although the Underwood herbarium contains sheets of this species from New York,

* "Our Native Ferns and Their Allies," by Lucien Marcus Underwood. Sixth edition revised. New York, Henry Holt & Co., 1900. 12mo. 156 pp. \$1 00.

and its occurrence in Pennsylvania and Maryland is attested by numerous accessible specimens. In the citation of the literature of ferns, the past ten years is hardly represented, although this has been a most fruitful period as regards publications on ferns. On the whole, the position taken by the author in reference to nomenclature will be likely to please the strict scientist, since it most correctly represents the radical side of the question. The conservative should value it also, for this very reason, even if he cannot agree with the author's conclusions. It is to be regretted, however, that Prof. Underwood has taken so radical a stand in a book, which like this, is used largely as a manual in the schools. It certainly opens the way for a conservative rival. The great mass of independent fern students will scarcely be inclined to accept all these changes, and the young student, fresh from school, will have to unlearn many names and acquire new ones before he will be fitted to converse understandingly upon ferns.

Those who are interested in archæology will find Prof. Moorehead's "Prehistoric Implements"* a volume well worth a place among their books. It contains illustrations of nearly three thousand specimens of Indian relics, accompanied by a copious text describing the objects and the places in which they were found, together with a discussion of their uses. Seemingly all the forms in North America are figured. Pottery, pipes, drills, ornaments, ceremonials, pestles, axes and arrowheads are shown alongside of many other objects whose use is still a matter of uncertainty. Prof. Moorehead is well known as an authority in his chosen field, but in order to secure accuracy he has had the text pertaining to each section of North America prepared by specialists residing in their respective sections, to which are added many notes by the author. The archæology of each section, thus treated by itself, renders a reference to the forms of any region very easy. The book is printed on good paper, substantially bound in cloth and will be found to answer most of the questions the young collector is likely to ask.

"Prehistoric Implements; a Reference Book," by Warren K. Moorehead, Saranac Lake, N. Y., 1900. Published by Robert Clarke & Co., Cincinnati. 8 vo. 424 pp. Price, \$2.30.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—The President of the Chapter offers specimens of *Trichomanes Petersii* to Chapter members sending a self-addressed envelope.—*M.*

—The name of Miss H. Mary Cushman, 300 North 5th street, Reading, Pa., should have appeared in the list of members for 1899. Miss Cushman joined the Chapter in 1897.—*M.*

—One energetic member writes: "Out of fifteen members obtained last year, I was the missionary who converted three. One-fifth is at least a fair proportion of converts for one member to make." Would it not be well to try to lessen his proportion next year by making our own greater?

—Since July the following fern students have become members of the Chapter Mrs. A. E. Goetting, Fargo, Clinch Co., Ga.; Miss Laura Lazenby, Statesville, N. C.; Miss Agnes C. Robertson, 108 Cottage St., Fall River, Mass.; Mrs. William R. Brown, 706 Forest Ave., Kansas City, Mo.; Fred K. Luke, Ohio State University, Columbus, Ohio; J. C. Black, Wooster, Ohio; Rev. J. M. Bates, Long Pine, Neb. We welcome them all. A new list of members will be published in the Annual Report, to be issued in January.—*C.*

Election of Officers.

The eighth annual election of officers of this Chapter occurs during the present month. The Executive Council has prepared the following list of candidates: *For President*, William R. Maxon, Washington, D. C.; G. A. Woolson, Pittsford Mills, Vt. *For Vice-President*, B. D. Gilbert, Clayville, N. Y.; Rev. S. M. Newman, 1818 M St., N. W., Washington, D. C. *For Treasurer*, James A. Graves, Susquehanna, Pa.; C. F. Saunders, 307 Walnut St., Philadelphia, Pa. *For Secretary*, Miss Margaret Slosson, Andover, Mass.; Miss Nellie Mirick, Oneida, N. Y. All members not in arrears for dues are entitled to vote and are urged to do so. Voting begins October 1st and ends November 1st. Postal cards are preferred for balloting. They should be sent to Homer D. House, 726 South Crouse Ave., Syracuse, N. Y., who has been appointed Judge of Elections. Let all vote early, not necessarily for the candidates mentioned, but, if desired, according to personal choice. Those having the highest number of ballots will be declared elected.—*M.*

\$4 cts. per Year.
15 cts. per Copy.

Vol. IX.

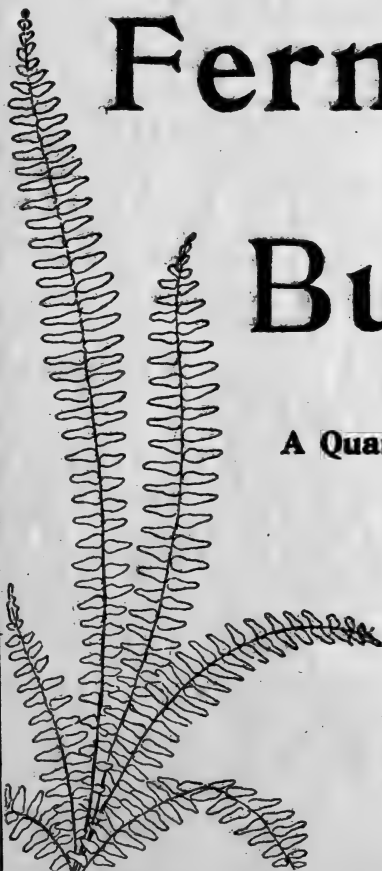
No. 1.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

JANUARY.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1901.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

Awarded Grand Prize at the Paris Exposition.

If this paragraph is marked, your subscription has expired. The mark indicates the time it expired as follows:

- | | |
|-----------------------------|----------------------------|
| 1—With the previous volume. | 2—With the present number. |
| 3—With the January number. | 4—With the April number. |
| 5—With the July number. | |

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. All arrearages must be paid.

Personal checks must contain ten cents extra for collection. Otherwise credit will be given for the amount less collection fees.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT. WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

WHEN YOU WANT A BOOK

Of any kind, send us your order; when you want prices on a list of books, write us about it. We can supply any book, from any publisher's catalogue, and usually at a lower price than your bookseller offers it. Our catalogue of Natural History and Outdoor books is nearly ready. Send for it. Address Willard N. Clute & Co., Binghamton, N. Y.

WANTED—Back Nos. of The Fern Bulletin to complete files as follows: Vol. I-III, Nos. 2-7, 11, 12; Vol. IV, No. 1; Vol. V, Nos. 1 and 3. O. B. Douglas, M. D., Suncook, N. H.

WANTED—To complete files, Nos. 2-7, 11 and 12 of Vol. I-III, and No. 1, Vol. IV, Linnaean Fern Bulletin, and Nos. 1 and 3 of Vol. V, Fern Bulletin. Any reasonable price paid. O. M. Olson, Fort Dodge, Iowa.

BULLETINS WANTED—To complete files Nos. 2, 3, 4 and 5 of Vols. I-III, Linnaean Fern Bulletin, and No. 1, Vol. IV. Address C. B. Atwell, Northwestern University, Evanston, Ill.

FOR EXCHANGE—Four copies Fern Bulletin, Vol. IV, No. 4, for specimens of rare ferns. *Schizaea pusilla*, *Azolla Caroliniana* and *Lygodium palmatum* especially wanted. R. H. Rich, Box 238, Newburyport, Mass.

WANTED—To exchange sets of from 20 to 30 specimens of Eastern New York ferns, containing among others *Schizaea*, *Lygodium* and *Scolopendrium*, for an equal number from the Central, Southern or Western States. The Fern Bulletin, Binghamton, N. Y.

THE
FERN BULLETIN

A Quarterly Devoted to Ferns

LIBRARY
~~NEW YORK~~
BOTANICAL
GARDEN

EDITED BY WILLARD N. CLUTE

VOLUME IX

BINGHAMTON, N. Y.
THE FERN BULLETIN CO.
1901

CONTENTS

	PAGE.
Abnormal British Ferns.....	9
A Changed Conception of Species— <i>L. M. Underwood</i>	49
A List of Fernworts Collected in Jamaica— <i>Willard N. Clute</i>	16, 43, 67
A New Form of <i>Cystopteris</i> — <i>Willard N. Clute</i>	64
A New Form of <i>Lycopodium</i> — <i>Willard N. Clute</i>	8
A New Species of <i>Asplenium</i> — <i>B. D. Gilbert</i>	53
A New Station for <i>Asplenium ebenoides</i> — <i>G. A. Woolson</i>	89
A New Variety of <i>Dryopteris munita</i> — <i>A. A. Eaton</i>	7
A Rich Locality— <i>William Palmer</i>	18
Benjamin Davis Gilbert.....	66
Book News.....	21, 46, 69, 94
<i>Botrychium matricariaefolium</i> — <i>George E. Davenport</i>	37
California Fern Gossip— <i>S. B. Parish</i>	73
<i>Cheilanthes lanosa</i> at New Haven, Conn.— <i>Gilbert Van Ingen</i>	7
Color in Young Fern Fronds— <i>C. F. Saunders</i>	5
<i>Dryopteris simulata</i> in Central New York— <i>H. D. House</i>	84
Editorial.....	20, 44, 68, 93
Fairy Rings Formed by <i>Osmunda</i> — <i>Willard N. Clute</i>	86
False Trinomialism— <i>William Palmer</i>	13
Ferns and Allies at Unalaska and Nome City— <i>J. B. Flett</i>	31
Generic and Specific Names.....	90
Helps for the Beginner— <i>W. N. C.</i>	11, 38, 57
New Way of Growing Ferns— <i>W. N. C.</i>	91
Nomenclature and Varieties— <i>G.</i>	6
Notes.....	20, 44, 94
Notes on American Ferns— <i>William R. Maxon</i>	59
Our Miscellany.....	19
<i>Polypodium incanum</i> — <i>Thomas Meehan</i>	28
Resting of <i>Ophioglossum</i> — <i>W. N. C.</i>	12
Southern Extension of the Range of <i>Polypodium Scouleri</i> —	

	PAGE.
<i>S. B. Parish</i>	40
The Climbing Fern in Spring— <i>C. F. Saunders</i>	30
The Earliest Fern— <i>A. A. Eaton</i>	91
The Flowering Ferns.....	38
The Christmas Fern.....	11
The Genus <i>Equisetum</i> with Reference to the North American Species— <i>A. A. Eaton</i>	3, 33, 61, 81
The Linnaean Fern Chapter.....	24, 48, 72, 95
The Quillworts.....	57
The Range of <i>Polypodium Californicum</i> — <i>B. D. Gilbert</i>	92
The Rock Relations of the Walking Fern— <i>E. J. Hill</i>	55
The Story of a Fern Hunt— <i>Geo. D. Hulst</i>	1
The Ternate Botrychia in Central New York— <i>B. D. Gilbert</i> ..	25
Thomas Meehan.....	87
Two Fern Allies in Central New York— <i>J. V. Haberer</i>	88
Two New Fern Lists—I.— <i>Geo. E. Davenport</i>	77







LUCIEN MARCUS UNDERWOOD

THE FERN BULLETIN

VOL. IX.

JANUARY, 1901.

NO. 1.

THE STORY OF A FERN HUNT.

BY GEORGE D. HULST.

I N the spring of 1885 I was a delegate to a church convention held in Syracuse, N. Y. There I met a lady who was an enthusiastic lover of ferns. It goes without saying that I was told of the exceeding richness of that region in these forms of plant life. *Scolopendrium* was upon her lips very often, and that was a glorious day when, with her, I visited Scolopendrium Lake. But there was another fern which was, if possible, of even greater interest—*Botrychium lunaria*. About three members of the Syracuse Botanical Club knew its locality, and they would reveal the secret to no others. And, just think of it—two of these were ladies! Many searches had been made by eager enthusiasts, so I was told, but the secret place had not revealed itself.

I was so discourteous as to laugh at the unfortunates, and so conceited as to declare it as my belief that any one who had time and persistence could find the station if he desired. I was challenged at once to prove my words, and I accepted the challenge. I took my next vacation during July at the village of Jamesville, about six miles south of Syracuse, and close by Scolopendrium Lake. I read up the history of the fern as it grows in Europe so as to know where to look and what to look for, and when I arrived at Jamesville I began a regular and systematic tramp in as nearly as might be parallel lines over the "area of certainty," a tract of country of not more than five miles square in area. The parallel lines were not far distant from each other, and the whole tract was thus thoroughly covered. It was tramp, tramp, over cliffs, through bogs, up and down steep slopes, along the banks of brooks and the edges of precipices. I found plenty of other good things, among others the only specimens of *Pellaea stelleri* ever found there, so I was told; a new station for *Scolopendrium*, with the largest and loveliest of fronds; most beautiful specimens of *Cystopteris bulbifera*, one of them forked; *Camptosorus* in endless quantity, one with four steps in its walking habit; all these and more, but no *Botrychium*.

At last the ground was all gone over, and, after my boasting and trouble, I was defeated. A day or two after, the hotel proprietor said to me, as I came in from a tramp: "I am sorry you were out to-day; a friend stopped here, who, when I told him you were hunting for flowers, said there was one which grew near his home, of which Prof. Peck of Albany said that, so far as he knew, it was the only place in America where it grew." Very early the next morning I was on my way to the home of his friend, some miles away, only to find he had already gone to Syracuse for the day. His daughter, however, remembered hearing her father speak of some rare plant which grew at a certain place on the farm. I went to the place, and sought vainly. I did find specimens of *Ophioglossum vulgatum*, the first I had ever seen growing, but no *Botrychium*. I finally had to give it up, as it was late in the afternoon, and I had gone fasting all day.

After my usual fashion I started for home, on a "bee line," as nearly as I could make it, across pasture fields, down a ridge of cliffs, down a steep wooded descent, when, in a little open place, I came upon some fronds of *Phegopteris dryopteris*, the finest I had ever seen. I ran my hand in the soft earth under a bunch of them, rooted them out, and raised them to look more closely upon their grace and beauty, when to my astonishment, and, I need not say, delight, I saw also in my hand a specimen of my eagerly-sought-for *Botrychium*! There I was, right "in it." I dared, discreetly and with moderation, to take a few specimens, but I had the locality!

That evening the gentleman, returning from Syracuse and hearing of my visit, hastened to the hotel to find me. He expressed his regret that he had not been at home to show me the plant. "But," I said, "I found it, and a pretty little fern it is." "Fern," said he; "it isn't a fern. It belongs to the catnip family." I went again, and was shown where for many years *Salvia scleria* had been growing wild. There had been more luck than I had known, and not the least was that I had not found that man at home that day!

It is only fair to myself to say the plant was not found in that "area of certainty" by considerable. And it may also be added, it did not grow under the common European conditions. I had agreed to tell the locality, if I found it, to my lady friend whose challenge I took up. So there were two more in the secret!

THE GENUS *EQUISETUM* WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON.

SIXTH PAPER.

E. PRATENSE EHRH.

RHIZOME solid at center, sharply 7-8 angled, dull black, without felt, the sheaths and teeth usually whole. Stems dimorphous; fertile at first, fleshy and wanting chlorophyll, often perishing at this stage; others develop a few whorls of branches at the upper internodes where the spike withers, and persist through the season with the appearance of sterile stems. One form appears to be intermediate, with fewer branches than the sterile and smaller spikes than the normal fertile plants. Sterile stems smoothish below, but becoming very rough above, grooves 8-20, small; keels convex, with cross bands of silicious teeth, in threes; sheaths cup-shaped; leaflets nearly flat, with indistinct groove in the keel; commisural groove narrow, very sharp and deep; teeth with dark center and hyaline borders, mostly united except at the short, sharp point; stomata in two lines in each groove; central cavity $\frac{1}{3}$ the total diameter of the stem.

Branches in thick verticils, solid, 3 or rarely 4-5 angled; sheaths with ridged leaflets and broad ovate short teeth. The branches are recurved at first, but finally become horizontal or even erect, beyond the middle. They are usually about 4 inches long, or occasionally an inch more, the general aspect being that of *arvense nemorosum*. The stems are about a foot high, the lower third naked. The basal internodes are an inch long, and the others gradually decrease to lengths of $\frac{1}{4}$ inch near the top. They are constricted under the nodes when dry, and densely covered with rough teeth, which may be seen without a lens when held to the light. In many respects this is intermediate between *arvense* and *silvaticum*.

This is a northern species, common to both hemispheres from 43° to the Arctic sea in Europe and Asia, and from Behring sea and Alaska to nearly 60° in America. It is very local, especially in the southern part of its range, and more common in Europe than America. It does not range south of Siberia in Asia. It reaches its southernmost limit in America at Gloucester, N. J. From here it ranges northeastward to Gaspé, Quebec, and north-

westward through Michigan and Minnesota (where it is reported to be common), to Hudson Bay, St. Paul Island (*Coville and Kearney*), and Popoff Island, one of the Shumagins (*Trelease*). It is also found westward to the Rocky Mountains and Colorado.

Milde says this species does not appear to grow in swamps, peat, pure sand or among rocks. It thrives in humus and sand, as on river borders, among dwarf willows. From here it wanders to the borders of woods where *Anemone nemorosa*, *Luzula campestris* and *Ranunculus acris* grow. It is evidently quite common in rye-fields in Germany, as it is nearly always present in the straw in which German glass is packed.

VARIETIES.

Several varieties have been described in Europe, but only the following appears to have been collected in America:

1. *Nanum* Milde. Sterile stems 3-7 inches tall, naked for one-half to two-thirds of the height, sparsely scabrous, 6-9 angled, upper sheaths as broad as long. Branches three to nine $\frac{1}{4}$ -1 inch long, horizontal or recurved, 4 angled, of 4-7 internodes. Fertile stouter, less rough, 5 inches tall, of 7 internodes, sharply 7 angled, the upper nodes 3-7 branched. Leaves broad, sharply keeled at base, rounded in the center, slightly grooved above. Teeth two-thirds as long as the sheaths, white and membranous, with firm black base and often narrow black center.

St. Paul Island, Behring sea, collected by Coville and Kearney (No. 1840) of the Harriman Expedition, 1899. The only American locality. The type is European, from the mountains of Tyrol, 6,500 feet elevation. It is also reported from England. I have not seen authentic specimens, and Milde's description does not exactly fit.

Seabrook, N. H.

[The material illustrating *E. telmateia* is now ready for distribution, as is also that for *E. silvaticum*, which is to be discussed in April. The two will therefore be sent out together. There are twelve sheets in the set, at 5 cents each. The sets will be sent at once to all who have ordered the series. Others should address Mr. Eaton. Those whose sets lacked certain sheets of *arvense* will receive them free with this distribution.—ED.]

Discorides said that ferns and reeds could not grow together, the one perishing where the other is planted.

"The fume of ferne being burned driveth away serpents, gnats and other noisome creatures." —*Parkinson*.

COLOR IN YOUNG FERN FRONDS.

By C. F. SAUNDERS.

THE enjoyment which variety of color affords and which lends so great a charm to the study of flowering plants, is not entirely denied the fern lover. The brown or cinnamon-colored fertile parts of the *Osmundas*—so marked as to have earned for these in popular speech the name of flowering ferns—are familiar to all. Then, too, the markings of the frond backs of some species by the fruit dots—for instance, those of the common evergreen woodfern (*Dryopteris marginalis*)—are strikingly beautiful in white and black and brown. The most pleasing display of color, however, is probably that noticeable in the spring, when the young fronds are uncoiling and when they are often flushed with exquisite tints—evanescent, to be sure, but very real while they last. The following notes, made last spring, may be of interest to some reader. The species mentioned are all abundant in the neighborhood of Philadelphia:

Dryopteris acrostichoides (Christmas fern). The crosiers are silvery-green, due to an abundant covering of white hairs.

Adiantum pedatum (Maiden-hair). The uncoiling fronds are a deep magenta, rather unpleasantly reminding one of new-born mice.

Onoclea sensibilis (Sensitive fern). The first appearance, while sometimes green, is frequently tawny or reddish-brown, frosted with a scattering of coarse white hairs or chaff. The green pinnæ of the young fronds are often beautifully edged around with a border of red, making, with the red stipes, a very pretty effect.

Pteris aquilina (Brake or Bracken). The crosiers of this fern exhibit a tinge of rosin brown, glistening in the sunlight like a garment of old gold. This color appears to reside entirely in a covering of hairs which drop off as the fronds uncoil, leaving the latter green.

Woodwardia areolata, a coast fern not uncommon in southern New Jersey swamps, makes its bow to the new season in a suit of reddish-brown.

Woodwardia Virginica (Chain fern). These young fronds are frequently of a delicate yellowish-brown or orange tawny tint, deepening to a dull crimson at the margins of the pinnæ. The young stipes are also crimson. As the plants of this species are

very social, the bogs where they are uncoiling in late May are noticeably tinged with a warm blush of color. Sometimes the whole expanded frond, at that early season, is suffused with a crimson tone, paling through evanescent browns and reds and orange, until the persisting green is reached.

Philadelphia.

[Mr. Saunders' entertaining and suggestive notes do not exhaust the list of our common ferns that enter the world clad in colors other than green. The Lady fern (*Athyrium filix-femina*) begins life in a combination of pink and pale yellow; the Royal fern (*Osmunda regalis*) has a wine colored stipe beneath its cloak of light-brown wool, and the fruiting pinnules of the Interrupted fern (*O. Claytoniana*) are ashy green, almost black, before they take on their better-known color. The unrolling blade of the Royal fern, too, presents a beautiful contrast between the ochraceous young pinnæ and the deep green spore cases, which they still half conceal. No doubt other instances will be recalled to mind by the attentive student.—ED.]

NOMENCLATURE AND VARIETIES.

HOW shall we distinguish by nomenclature a true variety from an occasional variation? Such is the substance of Mr.

Clute's question in the October issue of *THE FERN BULLETIN*. The method of indicating a variety is already fixed, viz., by a trinomial. I hardly like his suggestion of using the word *varietas* to distinguish the other. That word has a definite meaning and is really understood in the case of a trinomial. The Germans have a sensible way of distinguishing specimens which vary from the normal and yet are not permanent varieties. They use the word *forma*, a form, generally abbreviated to the letter *f*, which indicates that a certain form is often found, but may occur on the same plant with normal fronds, or may be found on a plant this year but not next year, or is a form of early spring or of late fall, and so on. These forms differ from the normal and are distinct enough to be recognized by one who knows them, or even to mislead a person who does not. Hence it is desirable that they should be designated by a definite name and described. Take the case of *Osmunda cinnamomea f. frondosa*, which Mr. Clute cites, or *Equisetum hiemale f. autumnale*, the late-growing form which sends out branches from the upper nodes. Everybody knows that these are only occasional forms, not permanent varieties, and it is right that the names given to them should indicate this.

In the catalogue sent out by the Vienna Botanical Exchange this method is adopted, and some specimens received from Europe this year are labeled on the same plan. Perhaps it might be well for the Chapter to take a vote on this matter and definitely settle it so far as our members are concerned. A postal sent to our secretary, Miss Slosson, voting for *varietas* or *forma*, would express the opinion of the sender.—G.

CHEILANTHES LANOSA AT NEW HAVEN, CONN.

BY GILBERT VAN INGEN.

WHILE examining the face of West Rock, near New Haven, in October, 1892, the writer had the good fortune to find several clumps of *Cheilanthes lanosa*, very few localities for which are known in the northern Atlantic States. The following June another visit was made to the locality and a number of fine plants were secured. The specimens were shown to Prof. D. C. Eaton of Yale University, and by him said to be the first of that species found in Connecticut.

The locality is quite difficult of access, being on the precipitous face of West Rock, about half way up the cliff, under a small rustic lookout built on the edge of the cliff on its south face overlooking the village of Westville. Future collectors should use a rope and have themselves lowered from the brink of the cliff. The fern seemed to be growing vigorously in the crevices of the basalt columns, some of the leaves having a length of nine inches.

The face of East Rock, a similar basalt cliff, was searched for *Cheilanthes* without success; but East Rock has a westerly exposure, exposed to the heavy storms. *Cheilanthes lanosa* has been found in the vicinity of the Hudson valley only in localities with southerly or easterly exposures.

New York.

A NEW VARIETY OF DRYOPTERIS MUNITA.

BY ALVAH A. EATON.

RECENTLY I received from Mr. Joseph C. Love of Berkeley, Calif., a very marked and distinct variety of *Dryopteris munita* which deserves especial notice. It was found in a clump of about six plants, evidently all from one original spore, in the hills above the town of Berkeley, not far from the college grounds. Diligent search has failed to bring to light any more

specimens, but the originals are now under cultivation and are doing well, so we may expect the variety, which will certainly be of value to horticulturists on account of its beauty, to be perpetuated. I would describe it as follows:

POLYSTICHUM MUNITUM f. *FLABELLATUM* forma nov. Rachis dichotomously 2-4 times forked, the ultimate divisions simple or flabellately expanded and 6-10 pointed; lower pinnæ distant, mostly at right angles to rachis, upper approximate and upwardly falcate, all flabellately dilated and 6-10 pointed at tip, more or less folded like a partly-closed fan.

This is a natural variety, which is cristate like the multitude of greenhouse ferns, showing, perhaps, a natural tendency to variation. I have seen the closely related *acrostichoides* with a tendency in this direction, and English horticulturists have a garden variety *grandiceps*, apparently much like this. Type in Chapter herbarium.

I wish to call attention to the wide field before American students opened by the study of natural varieties of our ferns. It is improbable that many new species will be discovered, but a perennial interest attaches to the study of the range of variation of those already known. Our English cousins are ahead of us in this, owing to their restricted range and numerous investigators. For this there is a tendency in some quarters to sneer at their so-called hair-splitting distinctions; but while one frond, or half a frond, of a species is sufficient for a herbarium specimen, for one whose collection is very general or a fad, it appears to me that no specialist's herbarium is complete without showing every variation of size and form and cutting of a species, its most eastern, western, northern and southern habitat, whether within our borders or not. I am aware that this view precludes the possibility of complete collections, but it is something to strive for, and after all it is the unattainable that attracts us most.

Seabrook, N. H.

A NEW FORM OF LYCOPODIUM.

BY WILLARD N. CLUTE.

DURING the early part of last September, Mr. William H. McDonald, while exploring some abandoned clay-pits on the southern end of Staten Island, N. Y., had his attention attracted by some peculiar forms of *Lycopodium*, specimens of which were subsequently sent to me for identification. These

proved so interesting that I desired to see them growing for myself, and about a month later I had the pleasure of spending a day with Mr. McDonald in their haunts, where we both made extensive collections of it.

A careful examination showed that the clay-pit contained not one species, but three. The form recently described as *L. adpressum* was most abundant, but growing with it were a few specimens of *L. annotinum* and some other larger ones of *L. alopecuroides*. Incidentally it may be remarked that there were so many intergrading forms between *L. alopecuroides* and *L. adpressum* in the same square rod as to shake one's belief in their being distinct species, and make it little wonder that Mr. McDonald overlooked one species at his first visit.

The interest of the trip, however, centered in an unusual form of *L. adpressum* with several spikes on one stem, and which Mr. McDonald characterizes as follows:

LYCOPodium ADPRESSUM forma POLYCLAVATUM McDonald.
Appearance of the plant similar to the type, stout and rather fleshy; sterile branches often very short, fruiting portion from 2 to 12 inches high, branching above with from two to six or more short or long-stalked spikes; spikes usually an inch or less in length, often abortive, or with the appearance of sterile branches. Type in the herbarium of Willard N. Clute.

The plants were growing very thickly together in the sterile soil and exposed to the full sun, leaving little doubt that the peculiar form is due to the location rather than to any natural tendency of the species. It is, however, quite worthy of a name to distinguish it.

Binghamton, N. Y.

ABNORMAL BRITISH FERNS.

THE number of *Indian Gardening and Planting*, of Calcutta, for September 20th, contains a list, with descriptions, of abnormal British ferns found by Charles T. Druery, which we here condense for such of our readers as are interested in the subject:

In a recent paper to the British Pteridological Society I gave particulars of such well-marked varieties as had fallen to my lot in my fern-hunting expeditions in England, Scotland and Ireland, and as I cannot help thinking that many of your fern students may be interested therein, I give you a short summary of the

same. Many older fern hunters can eclipse my list, utterly; one, Mr. James Morley, residing in Dorsetshire, having found no less than 600 well marked and constant forms, while his late neighbor, Dr. Wells, found some hundreds more—all, be it observed, growing absolutely wild among the common or normal forms. Classifying my finds and omitting dates, which are superfluous, they stand as follows:

Blechnum spicant: varieties cinnabrum, polydactylum, strictum, contractum, subcruciatum, crispatum, revolvens, congestum, anomalum, trinervium, analepis.

Athyrium filix-femina: varieties oreopteroides, laceratum, cristatum, medeodeficiens, deltoideum, revolvens, candelata-cruciatum.

Dryopteris filix-mas: varieties polydactyla, cristata, medeodeficiens, gracile.

Dryopteris montana: varieties cristata-gracile, depauperata, truncata, congesta, variegata.

Dryopteris dilatata: varieties polydactyla, stipitata-lacinata.

Scolopendrium vulgare: varieties corymbiferum, grandiceps, traverso-cristatum, marginatum, lobatum.

Asplenium trichomanes: varieties cristatum, depauperatum.

Polypodium vulgare: varieties marginatum, bipinnatum, minimum, longipinnatum.

Polystichum angulare: varieties deficiens, sublinearis. Curiously, though, this species has been particularly generous in varieties. I have found nothing thoroughbred.

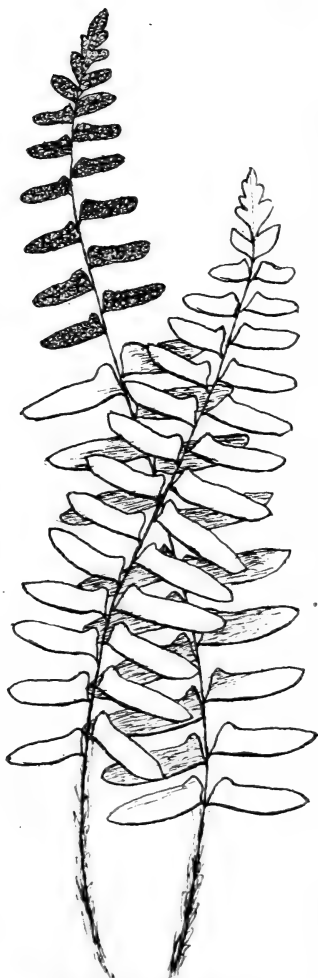
I must add to my list two varieties found in the Azores (Fayal) in a very short search, viz., *Pteris aquilina polydactyla*, and *Asplenium hemeonitis cristata*.

In considering the above list it must be borne in mind that my opportunities for fern hunting are confined entirely to the two or three weeks' autumn vacation. No year has been absolutely barren of results and in some I have been particularly fortunate. To those, therefore, residing in ferny districts of India, I cannot too warmly recommend a similar search, feeling sure that it will be similarly rewarded. The species lover cannot afford to ignore varieties, and if the sub-varieties (as I should call them), which are frequently noted, are worthy of notice, surely still more so are those marvelous instances where nature goes a step further and absolutely transforms specific types on altogether new and more beautiful lines. I need hardly say that I would be very happy to receive fronds of such finds and to give an opinion thereon, but I should like to receive them in good form.

Acton, London, W.

HELPS FOR THE BEGINNER.*

III.—THE CHRISTMAS FERN.



Polystichum acrostichoides
(The Christmas fern).

pinnate fronds are also known to occur.

IF there exists in the Northern or Eastern States a stroller in the winter woods who is not familiar with the sight of the Christmas fern, there must be something wrong with his powers of observation, or the locality in which he walks. From October to March the sturdy dark green fronds are most conspicuous objects, especially in rocky woods, and in the warmer parts of the year they are just as abundant, though perhaps less noticeable amidst the other vegetation.

The Christmas fern (*Polystichum acrostichoides*) may be known at once from all our other ferns by the curious habit it has of bearing its fruit dots on the much-reduced upper portion of the fronds. On these pinnules they are so thickly set as to completely cover the under surface. Sterile fronds may frequently be mistaken for those of the polypody, but it should be remembered that this species differs from the polypody in being completely pinnate with stalked pinnules, each of which is eared on the upper edge at base.

A form is frequently found in which the pinnules are deeply serrate and the fruit dots not confined to the diminished upper portion, but borne on the tips of the lower pinnæ as well. This is the variety *incisum*. Forms with twice pin-

*Begun in July, 1900. The series will include all our American ferns.

Our fern ranges from Arkansas and the Carolinas to Canada. North of its range there is a species that very much resembles it, called the holly fern (*P. lonchitis*). It bears its sporangia on the backs of ordinary fronds, and so may be easily distinguished. This is also evergreen.

A third species—*P. Braunii*—is found in Canada and sparingly in the Northeastern States, in mountainous regions. It is taller than its relatives and more finely divided. It resembles some of the wood ferns, but need never be mistaken.

The *Polystichums* may be separated from all our other ferns as follows:

Sori round, on the backs of the fronds and covered with a circular membranous indusium attached by the depressed centre.

Frond pinnate.

Fruiting part reduced, *P. acrostichoides*.

Fruiting part not reduced, *P. lonchitis*.

Frond twice pinnate, *P. Braunii*.

—W. N. C.

RESTING OF OPHIOGLOSSUM.

IF the several notes on *Ophioglossum* that have recently appeared have not conclusively proven that the species rests for a season, they have at least aroused an interest in the question, which further observation, now that attention has been called to the subject, is likely to definitely settle.

Something analogous to this resting runs through a great portion of the *Ophioglossaceæ*. It manifests itself in *Botrychium Virginianum* in the large number of sterile plants that always occur. Since many of these are larger than fertile plants near by, it may be conjectured that these are really mature plants that are taking a year off, so far as the production of spores are concerned. The same phenomenon is found in most of the *Botrychiums*, and is especially noticeable in our other common species—*B. obliquum*—where sterile fronds usually greatly outnumber the others.

As to *Ophioglossum*, the behavior of other members of the genus may throw some light upon our species. It is interesting to know that some forms produce numerous adventitious buds from the roots, and that this forms the chief means of propagation, the prothallia being seldom formed. Our species is known to occasionally produce these buds. It is possible that they re-

main dormant for years and start into growth in certain seasons when the conditions are right, thus giving the impression that the plants are normally more abundant than they really are. In "Ferns in Their Homes and Ours," Robinson states that it is difficult to keep our species of *Ophioglossum* in cultivation for more than two years, from which we might build up a fine theory that the Adder's tongue is really a biennial, and that a new growth which is sterile the first year and fertile the next springs from the buds on the old roots.

In some species of annual ferns, notably *Gymnogramma leptophylla*, the prothallium forms resting bodies, and Campbell conjectures that our species of *Ophioglossum* may do so, too. If true, this adds another factor to be taken into consideration. In any event the subject is an interesting one, and the foregoing speculations may contain some hint for the future investigator.—
W. N. C.

FALSE TRINOMIALISM.

BY WILLIAM PALMER.

ONE of the greatest evils that has grown up about the nomenclature of ferns, and indeed of many other groups, has been the abuse of the use of trinomials and binomials, especially the former. The early misconceptions of the true values of species and the rather flippant use of the word *variety*, used by horticulturists, have unfortunately been only too potent in promoting looseness of practice whenever it was considered necessary to differentiate by a Latin word some variant, supposed or real, from a supposed type or specimen.

Attention having been called to this matter by the editor of this journal in the October issue (p. 92), I have to offer the following for consideration:

Strictly considered evolutionally, there cannot of course be such a thing as a species. But following our present knowledge of living forms, we may define a species as an aggregate of closely and connectedly related individuals occupying a definable area and not intergrading with a similar aggregate. A species may be monotypic (without sub-species), or it may contain two or more sub-species (it cannot have one), all having specific characters in common, but each differing in possessing one or more characters of lesser value which grade into each other, the grading being definite and geographical, or geological, and definitely proved by

specimens. It is essential that such intergradation and variation should have been brought about entirely through natural causes, not by man's influence.

Accident of priority in naming has frequently resulted in cases like the following: A and B are species and each has two sub-species, for instance, a northern and a southern. The northern form of A was named first and is generally considered as a species with a southern sub-species, variety, race or form. But with B its southern form was named first, so that its later named northern relative becomes its sub-species, though the values in the two cases may be equal. As a matter of fact two sub-species, at least, of equal value as regards names, but of possibly very unequal values as regards characters, numbers of individuals, distribution and ecology, must compose every non-monotypic species. Therefore such a species is the sum of its component sub-species and its characters those common to all.

Unfortunately early views of the values of species and sub-species (varieties) were very different from our present advanced conceptions, and this old-time influence dominates much of our present nomenclature. Local variations, due largely and often entirely to man's interference with the topography, and freaks and monstrosities, have been often calmly described with Latin names. Little effort, and very often none, has been given to determining the ecological values of a supposed new form; and the ambition of the systematist to name something has frequently forced a new birth where maturer consideration might have revealed the true status.

Moore's volumes of "Nature Printed Ferns" are familiar examples of a perverted use of Latin trinomials, a practice too readily followed in America, and even recently, as indicated by the editor.

A solution of the evil is simple. It is to discard entirely all trinomials and quadrinomials based on freaks or mere local variations; they should have no place in a scientific Latin nomenclature. It follows that all valid described forms should be considered as species until proved to be intergrade; intergradation to be shown by specimens intermediate in character and geographical position—in fact by intermediate values. It is of course interesting and valuable to call attention to variants and to study their causes for existence, but it is unnecessary to burden our Latin nomenclature with names for them.

The use of trinomials by horticulturists does not affect these conclusions, for the true naturalist will in almost every case readily discriminate between the natural sub-species and the artificial varieties of the gardener and unthinking systematist. These views do not prevent the close student from naming forms with three or more terms when a comparative study of many specimens of a group renders it necessary, but it should be done strictly along ecological lines.

[While we agree with many of Mr. Palmer's strictures regarding the burdening of our nomenclature with Latin terms for every variation of a species, we can scarcely subscribe to his assertion that "all valid described forms should be considered species." Present day botanists find that some of the aggregates to which Linnæus and his contemporaries gave specific names, consist of two or a greater number of species, as species are now recognized. This being so, why is it not also possible to separate from the species a *sub-species*, having most of the characters of the type, but also certain points peculiar to itself? We can conceive of such a form continuing and reproducing itself indefinitely in a certain locality, but reverting to the type under other conditions. This form is not a species, nor is it a variety in the usual sense. Then, what is it? Evolutionists must admit of a time when a species, in its spread, exposed to new conditions, may begin to produce another form to take advantage of these conditions, but until the new form is fixed, and will not revert to the type, it should be considered a sub-species, although possessing characters not found in the type. This is our reason for advocating binomials for species, trinomials for variant races, and some other means of indicating forms due to seasonal or accidental variation.—ED.]

Miss Sadie F. Price records a specimen of *Dryopteris spinulosa intermedia* from Tennessee with a majority of the pinnæ from one to three times forked.

At Frederick, Md., I found an abundance of *Pellæa atropurpurea* growing from the masonry of a small bridge. This is built solid, of a granite sort of rock, and I found the fern on the sunny side, mainly, fastening itself in the mortar, but in places in such small depressions of the rock as to be almost incredible. This is an old bridge, but just how the ferns got there I am at a loss to say.—Guy L. Stewart, College Park, Md.

In parts of England ferns are called "devil's brushes," and it is thought to be unlucky to gather them.

A LIST OF THE FERNWORTS COLLECTED IN JAMAICA*

BY WILLARD N. CLUTE.

(Continued.)

CYATHEACEÆ.

ALSOPHILA R. Br.

39. *A. aspera* R. Br. A very common tree fern with dark foliage, which has gained it the name of "black tree fern" among the natives. (350).
40. *A. pruinata* Kaulf. Among the most magnificent of Jamaican ferns. The stipe is frequently more than eight feet long and the fronds large in proportion. Common in high elevations. Morce's Gap. (91).

HEMITELIA R. Br.

41. *H. horrida* R. Br. Common, especially in the lower hills. Cuna Cuna Gap. (266).

CYATHEA L.

42. *C. pubescens* Mett. Common at Morce's Gap. A tall and commanding species prominent in mountain forests. (90).
43. *C. arborea* Sm. The common tree fern of the lower hills. Stem quite smooth gray in color. Cuna Cuna Gap. (289).
44. *C. gracilis* Griseb. Morce's Gap, not common. A low species with stalked pinnules, which give the frond a peculiarly open appearance. (181).
45. *C. elegans* Hew. Above Moore Town, not very common. (261a).
46. *C. iussacii* Desv. Moody's Gap in deep shade. A large dark-colored species. (164).
47. *C. furfuracea* Bak. In moist forests, very common. Morce's Gap. (89).

POLYPODIACEÆ.

DICKSONIA L. Her.

48. *D. cicutaria* Sw. Cuna Cuna Gap, common. (292).
49. *D. dissecta* Sw. New Haven Gap. (108).
50. *D. rubiginosa* Kaulf. New Haven Gap. (351).
51. *D. Plumieri* Hook. Moody's Gap. (160).

*Begun in July, 1900.

DAVALLIA Sm.

- 52. *D. Spelunca* Bak. Common. (227).
- 53. *D. inaequalis* Kze. Common. Above Moore Town. (256).
- 54. *D. aculeata* Sw. Common, especially in the uplands. The plants trail over trees and bushes. Stem prickly, Cinchona. (102).
- 55. *D. fumarioides* Sw. Much like the preceding, usually at lower altitudes. Cedar Valley. (156).

CYSTOPTERIS Bernh.

- 56. *C. fragilis* Bernh. On rocks in the bed of Latimer river. The plants are rather smaller than the average. (146).

ADIANTUM L.

- 57. *A. deltoideum* Sw. Common in crevices of rocks along the road from Port Antonio to Manchioneal. Has much the habit of our *Asplenium trichomanes*, spreading in green rosettes. (286). The variety *Jamaicensis*, with larger and rounded leaves, was collected with the type.
- 58. *A. pulverulentum* L. Above Moore Town. Fairly common. This species has a superficial resemblance to the widely distributed *A. cristatum*. (140). Good specimens of the variety *caudatum* Jenm. were collected above Moore Town. (140a).
- 59. *A. obliquum* Willd. On wet rocks at Manchioneal. (286a).
- 60. *A. intermedium* Sw. In shade, Port Antonio, common. A very distinct species. (257).
- 61. *A. cristatum* L. Abundant in dry soil, on rocks, etc. Gordon Town. (42).
- 62. *A. concinnum* H. B. K. Abundant between Gordon Town and Guava Ridge. A very handsome species. (240).
- 63. *A. fragile* Sw. Common in dryish places. The fronds are of a peculiar bluish-green color. The pinnules are jointed to the rachids and drop off when the fronds are pressed. The only way to secure perfect specimens is to mount the plant when green and dry it in place. (234).
- 64. *A. tenerum* Sw. A tall and graceful species about Port Antonio and elsewhere in the lowlands. (116).
- 65. *A. trapeziforme* L. Near Gordon Town. This species is sold about the streets in Kingston. (305).
- 66. *A. denticulatum* Sw. Above Moore Town. This species was sent out under the name of *A. Kaulfussii* Kze., following Jenman in his "Ferns of Jamaica." (268).

67. *A. cuneatum* L. This species, although not native to Jamaica, appears to be naturalized about Cinchona, growing in waste places without cultivation.

HYPOLEPIS Bernh.

68. *H. nigrescens* Hook. Very common, climbing or trailing over bushes and trees at Cinchona. Stem and rachids very prickly. This has an exceedingly close superficial resemblance to *Davallia aculeata*. (110).

NOTHOLENA R. Br.

69. *N. trichomanoides* R. Br. Common on dry rocks above Gordon Town. The variety *subnuda* Jenm. collected with the type. (236).
70. *N. ferruginea* Desv. With the preceding and much resembling it. (280).

(To be continued.)

A RICH LOCALITY.

By WILLIAM PALMER.

AS I stood upon the few-plank bridge in a little valley near Potomac, Montgomery county, Maryland, on October 7 last, a few fronds in a thicket by the roadside attracted my attention, and *Dryopteris spinulosa* proved to be quite numerous. On the other side of the bridge a single plant of *Dryopteris Boottii* was almost hidden in the bushes, and about eighteen inches away was a plant of *Dryopteris cristata*, a species represented by numerous examples for some thirty feet along the little stream. A hasty examination of the banks revealed *Dryopteris spinulosa intermedia* in a clump, while *Polystichum acrostichoides* was common. The woodland non-fruiting form of *Dryopteris thelypteris* was also common with *D. noveboracense* near by. A clump of *Athyrium filix-femina* occurred here and there and also a few plants of *Asplenium platyneuron*. A little way from the bank were a few plants of *Botrychium Virginianum* and a single one of *B. obliquum*.

This little piece of low woodland is now a cow pasture, and doubtless all these ferns are doomed. The interesting feature of this display is the large number of species of *Dryopteris* in an area about fifty feet by ten, and especially the plant of *D. Boottii*, the fourth locality known from the vicinity of Washington and the only one I know of for Maryland.

Washington, D. C.

OUR MISCELLANY.

An article by W. R. Maxon, on the Tennessee stations for the Hart's-tongue fern, was published in the *Plant World* for September.

Have readers noticed in plants of *Asplenium ebeneum* a faint but delicious fragrance, or is this a peculiarity of the plants I have found on Shelter Island? The fragrance seems to come from the base of the fronds or the rootstock. It is sufficiently strong now, six months or more after the plants were collected, to slightly perfume one's hands when handling the dried specimens.—*Margaret Slosson.*

[A similar fragrance may occasionally be noticed in the Ebony fern's relative, *A. Trichomanes*. The fact that it is not always present in either may be explained upon the supposition that it requires a sterile soil to bring it out, just as the sugar maple yields the sweetest sap in the thin soil of a stony hillside, and not in the rich ground in the valley. With plants, as with men, adversity only serves to accentuate their good traits.—ED.]

I have in my wild bed in the garden a large bunch of *Dryopteris acrostichoides* which is rather freakish in its development. In July or August I found on it two fronds of which every pinnæ was bi-lobed at the tip. The angle they made was about like that in the familiar little spring flower called vulgarly "Dutchman's Breeches" (*Dicentra cucullaria*). One of the fronds was also forked at the tip. There were also a large number of fronds which were curiously cut-lobed and incised. All of these peculiar forms were from the newer plants on the outside of the bunch. The specimens were sent to the Chapter Herbarium.—*E. C. Anthony.*

The old negro women here are again offering the Climbing fern (*Lygodium palmatum*) in the Central market, where from now (November 1st) until Christmas time it will be sold more or less commonly for purposes of decoration. Local botanists know it only from one small station, but it evidently occurs in abundance elsewhere in the vicinity—just where we are not likely to discover, for the venders are extremely chary of information. With them it goes altogether by the name of "Alice's fern," a new one, perhaps, to most fern students.—*William R. Maxon, Washington, D. C.* [Can any one explain the derivation of this new common name?—ED.]

EDITORIAL.

PROFESSOR
UNDERWOOD

It is with great pleasure that we present in this issue the latest portrait of Dr. L. M. Underwood, whose activity in the study of ferns for more than twenty years has made him famous throughout the world and placed him at the head of American fern students. In this connection a word of biography will be of interest. Dr. Underwood was born at New Woodstock N. Y., Oct. 26, 1853, and began life on a farm. In 1877 he was graduated from Syracuse University, and from 1879 to 1883 taught in various western colleges. In 1883 he returned to Syracuse University, where he taught for nearly ten years. From 1891 to 1895 he was at DePauw University, and in 1895-6 in the Alabama Polytechnic Institute. In 1896 he became Professor of Botany in Columbia University, which post he now holds. He is also editor of the *Bulletin of the Torrey Botanical Club*. His chief work is the well-known "Our Native Ferns and Their Allies," which for two decades has been without a rival in its particular field, and is now in its sixth edition. Among his other works may be mentioned "Moulds, Mildews and Mushrooms," "North American Hepaticæ," "Review of the Genera of Ferns" and a host of papers on a variety of botanical subjects, although ferns and fungi have received the most of his attention.

NOTES.

—*Popular Science* for October contains an article by Willard N. Clute on the fern's struggle for existence in the Tropics.

—*Die Gartenwelt*, of Berlin, contains two articles on the genus *Nephrolepis* by Bernh. Othmer in the issues for October 20th and 27th.

—Two new candidates for honors in the botanical world are the *Gamophyllus* of Plainfield, N. J., and the *O. S. U. Naturalist* of Columbus, Ohio.

—One of the best little journals on out-door subjects for the general reader that we have seen is the new *Nature Study* of Manchester, N. H. Recent numbers contain three articles on the ferns and fern allies.

—THE FERN BULLETIN received the award of Grand Prize at the Paris Exposition. So far as known this is the only American botanical journal so honored.

—In the *Botanical Gazette* for December William R. Maxon discusses the specific validity of *Asplenium ebenoides*. He inclines to the belief that the fern is a fertile hybrid between *Camp-tosorus rhizophyllus* and *Asplenium ebenoides*.

—The papers presented at the New York meeting of fern students have been issued under the title of *Fernwort Papers*. Mr. A. A. Eaton describes four new species and one variety of *Isoetes* in his paper.

—In *Rhodora* for November Mr. George E. Davenport has some further notes on the crested form of *Dicksonia* recently described in this journal. He believes the plants have maintained their crested character naturally for twenty-five years.

—Mr. A. A. Heller, of Lancaster, Pa., has established a botanical journal to be known as *Muhlenbergia*. It will be issued at irregular intervals and devoted principally to articles by its editor, whose activity in matters botanical are nearly sufficient to keep one publication going. This journal wishes him success.

—In the Proceedings of the Biological Society of Washington for October 31 William R. Maxon gives the name of *oreophilum* to a form of the common polypody previously named *biserrata* by C. F. Millspaugh. It is characterized by the narrow acute and usually doubly crenate pinnæ.

BOOK NEWS.

A profusely illustrated volume on our Eastern ferns is announced to appear early in spring. The text, which treats exhaustively of the interesting facts about each species, is by Willard N. Clute, and the illustrations, both in black and white and in color, are by W. W. Stilson.

A list of the private libraries of Great Britain, Canada and the United States will soon be issued by G. Hedeler, 18 Nurnberger Str., Leipzig, Germany, who desires information regarding the private libraries of these countries, and the specialties to which they are devoted.

About twenty years ago Mr. Geo. E. Davenport began a Text Book of North American Ferns, which was laid aside when nearly completed. He has recently taken up the work again and it is expected that the book will soon appear. Mr. Davenport desires authentic lists of ferns from all localities. Here is a chance for some of our readers to render valuable assistance.

In "Mosses With a Hand Lens,"* Dr. Grout has put out an excellent little volume which will no doubt go a long way toward popularizing the study of mosses. One hundred of the most easily recognized species, representing more than forty genera, have been selected, and described in such a way that they may be identified without the use of a compound microscope. The book is exceptionally well illustrated and between text and illustration the beginner is likely to get a very good idea of our moss flora. Two good keys are given, one based on structural characters, the other on habitat, etc. There is also an illustrated glossary of a dozen pages, which cannot fail of being helpful to any student of the mosses.

Increasing interest in the study of fungi is bringing many new books into the field, but few of them pay much attention to the needs of the individual who wants to know, first of all, what a mushroom is. His wants, however, may now be satisfied by a handy little volume entitled "Among the Mushrooms,"† designed expressly for beginners and written by those who apparently have had their own early experiences well in mind. The book is full of the right kind of information and might without impropriety be called an introduction to the text-books. The matter is, for the most part, clear and intelligible, although cast in untechnical terms. The first part is devoted to the structure and growth of mushrooms, and is followed by a classification and description of the more noticeable and important kinds. There are several keys, by one or another of which the student should be able to discover the names and properties of his specimens. There is also a good glossary. The book contains nine plates from photographs and three in color. It will no doubt have a large sale.

*"Mosses With a Hand Lens," by A. J. Grout, 360 Lenox Road, Flatbush, N. Y. Published by the author, 1900. 12 mo., pp. 70. Price, \$1.10.

†Among the Mushrooms; a guide for beginners. By Ellen M. Dallas and Caroline A. Burgin. Philadelphia: Drexel Biddle, 1900. 12 mo., pp. 175. Price, \$1.50.

We cannot too highly recommend to those who are studying the forms of plants, Goebel's important contribution† on the subject, which has recently been translated into English. The German edition was issued in 1898, and presents the best modern opinion which has lost nothing at the hands of the translator. The present volume—the first part of the whole work—is not only complete, as regards the topics touched upon, but fairly exhaustive in the attention given to each. Its scope includes such matters as formation and differentiation of organs; relationships of symmetry in shoots, leaves and flowers; juvenile forms of organs; reversions; malformations, and their significance; the plant's response to external stimuli, etc. There are one hundred and thirty illustrations, and the book is well printed on good paper and well bound. It is hoped that the second part, dealing with special organography, may soon be issued.

A new feature has been introduced into mycological books by the publication in Professor Atkinson's "Mushrooms"‡ of a large number of illustrations from copyrighted photographs of fungi, mostly life size. The specimens so photographed have been labeled and preserved, making it possible at any time for students to refer to the originals. The book is of great value from these illustrations alone, but the lucid and comprehensive text accompanying them by such an authority as Professor Atkinson leaves little to be desired. The first three chapters treat of the form and development of the mushrooms, then follow five chapters on the mushrooms proper, and eight on what may be termed the allies—the puff-balls, stinkhorns, morels, hedgehog fungi, etc. Several chapters are also included on the chemistry of mushrooms, collecting, preserving, selecting for the table, and cooking. The chapter on cooking was written by Mrs. Sarah Tyson Rorer. There are also keys to the species and a glossary. Upwards of two hundred of the more common species of higher fungi are treated, and there are more than two hundred illustrations and several colored plates. The book is the best we have yet seen for the American collector of mushrooms. The edible and poisonous species are clearly distinguished, the places in which they grow indicated, and the species themselves accurately described.

†Organography of Plants. By Dr. K. Goebel. Authorized English edition by Isaac Bayley Balfour. Part I., General Organography. Oxford: The Clarendon Press, 1900. 8 vo., pp. 270.

‡Studies of American Fungi; Mushrooms, Edible. Poisonous, etc. By George Francis Atkinson. Ithaca, N. Y.: Andrus & Church, 1900. 8 vo., pp. 275. Price, \$3.00.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—The report of the New York meeting of the Chapter has been issued and a copy is being sent to all members not in arrears for dues.

—The Annual Report is expected to appear in January. All changes of address should be sent to the Secretary at once, so that the list of members may be complete.

—The October election resulted in giving the Chapter officers for 1901 as follows: President, William R. Maxon; Vice-President, B. D. Gilbert; Secretary, Miss Margaret Slosson; Treasurer, James A. Graves. A full statement will be published in the Annual Report.

—Seven new members were added to our list in the October FERN BULLETIN. We now have the pleasure of welcoming six more, as follows: Messrs. Julien Reverchon, Dallas, Texas; W. H. Clark, Plesna, Ontario; W. A. Stowell, Ramsey, N. J.; Thomas Bonser, Carey, Ohio; Mrs. W. A. Dixon, Baltimore, Md., and Miss Nellie Mansfield, Portland, Maine.

Rev. George D. Hulst.

It is with deep regret that we announce the death of Rev. Dr. George Duryea Hulst, which occurred very suddenly at Brooklyn, N. Y., on November 5, 1900, in the 54th year of his age. For thirty-one years Dr. Hulst has been pastor of the South Bushwick Reformed church, and death found him preparing to visit the sick. As he was about to leave the house, he sank to the floor and expired immediately.

Dr. Hulst was one of the best known ministers in the Reformed church, and among the foremost in all other good works. He was a Fellow of the American Association for the Advancement of Science, President of the Department of Botany of the Brooklyn Institute, and member of many other societies. He was an authority in entomology, and was at one time Professor of Entomology in Rutgers College. His botanical work is too well known to need comment here. Although he but recently became a member of our Chapter, he has long been interested in ferns. About two weeks before his death he sent us the article which appears in this number.

50 cts. per Year.
15 cts. per Copy.

Vol. IX.

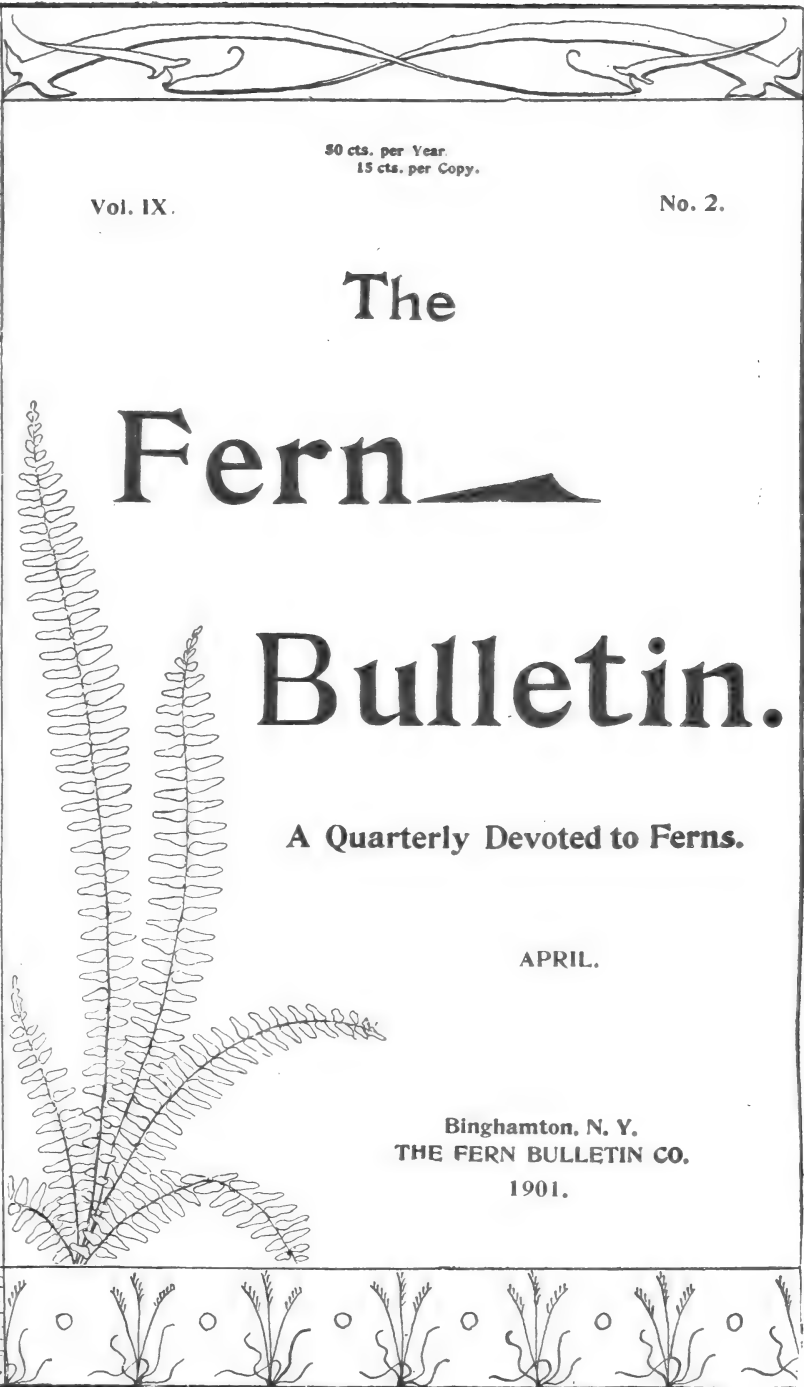
No. 2.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

APRIL.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1901.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

Awarded Grand Prize at the Paris Exposition.

If this paragraph is marked, your subscription has expired. The mark indicates the time it expired as follows:

- | | |
|-----------------------------|----------------------------|
| 1—With the previous volume. | 2—With the present number. |
| 3—With the January number. | 4—With the April number. |
| 5—With the July number. | |

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. All arrearages must be paid.

Personal checks must contain ten cents extra for collection. Otherwise credit will be given for the amount less collection fees.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT. WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

WANTS AND EXCHANGES

Special announcements inserted here for One Cent a word. No notice received for less than 25c. No charge for address.

WANTED—Back Nos. of The Fern Bulletin to complete files as follows: Vol. I-III, Nos. 2-7, 11, 12; Vol. IV, No. 1; Vol. V, Nos. 1 and 3. O. B. Douglas, M. D., Suncook, N. H.

WANTED—To complete files, Nos. 2-7, 11 and 12 of Vol. I-III, and No. 1, Vol. IV, Linnaean Fern Bulletin, and Nos. 1 and 3 of Vol. V, Fern Bulletin. Any reasonable price paid. O. M. Olson, Fort Dodge, Iowa.

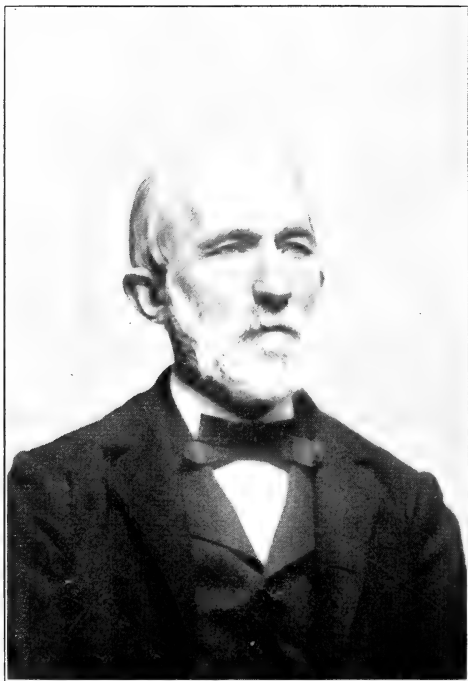
WANTED—Linnaean Fern Bulletin, No. 2. C. B. Atwell, Northwestern University, Evanston, Ill.

FOR ONE DOLLAR I will send postpaid, a piece of fernwork, size 9½ x 11 inches, suitable for framing, consisting of ferns found here. Laura F. Kimball, Box 18, National City, Cal.

WANTED—Asa Grey Bulletin, Vol. I, No. 1; Underwood's Ferns, editions 1, 2 and 4. T. J. Fitzpatrick, Box 1497, Iowa City, Iowa.

HEPATICÆ WANTED—Specimens and data regarding distribution of hepatic species in North America, and especially in the Susquehanna Valley. Specimens identified free when desired. William C. Barbour, Sayre, Pa.

WANTED—In exchange or purchase, *Living Asplenium Bradleyi*, *A. ebenoides*, *Dryopteris fragrans*, *D. Montana*, *D. Californicum*, *D. patula* and ferns of Florida and Arizona. Jas. N. Ferriss, Supt. Ferns, West Park, Joliet, Ill.



GEORGE EDWARD DAVENPORT.

THE FERN BULLETIN

VOL. IX.

APRIL, 1901.

No. 2.

THE TERNATE BOTRYCHIA IN CENTRAL NEW YORK.

By B. D. GILBERT.

DURING the fall of 1900 Dr. J. V. Haberer, President of the Asa Gray Botanical Club of Utica, N. Y., made an extensive collection of the varieties of *Botrychium ternatum* (Thunb.) Sw. within a radius of ten miles of Utica, in the valleys of the Mohawk and its tributaries. Dr. Haberer's specialty lies among the *Cyperaceæ*, but he had noticed how abundant the *Botrychia* were in that region, and was so attracted by them that he felt impelled to gather them. Having done so, he put them into my hands to be sorted and named. The collection is certainly extraordinary in number, and in the degree of variation shown. By actual count it numbers over 450 specimens, and it ranges from plants not over $3\frac{1}{2}$ inches high, including both root and fertile panicle, to those which are 16 inches high, with a sterile leaf 6 inches wide. The time of gathering extended from Sept. 18 to Nov. 6, most of them being obtained in October, as the plants do not mature until some time in that month.

Even a casual glance through this series of specimens is sufficient to convince one of the great amount of variation that occurs among these plants, and also of the fact that they belong to one species. The gradations from one form into another are such as to convince any but the most prejudiced observer of this fact. There are four principal forms, viz: *B. ternatum obliquum* Muhl., *B. ternatum dissectum* Muhl., *B. ternatum intermedium* D. C. Eaton, *B. ternatum Oneidense* var. nov. In addition to these there are three other beautiful forms which are represented by only one specimen each. It has seemed best to hold these latter in abeyance, in hopes that further material may be obtained another season.

My observations on the collection are grouped under the separate varieties as follows:

Botrychium ternatum obliquum Muhl. This is the usual type of *obliquum* in this country, where it is not known that the species proper exists. The segments of the leaf are generally

long and slender, but always acute and more or less oblique or one-sided. The range of size is given above. In this variety occur most of the plants with two and three sporophylls, which are by no means uncommon. In these cases the common stipe is usually very short, $\frac{1}{2}$ to $\frac{3}{8}$ of an inch long, with the second fertile stipe branching from the leaf stalk about the same distance above the first. But sometimes the common stipe is much longer, from 2 to $3\frac{1}{2}$ inches, which gives the plant a peculiarly tall and elegant appearance. In a specimen with three sporophylls, the first and largest of them branches off just above the root, while the other two branch off an inch higher on the stipe of sterile frond and exactly opposite each other. So far as observed none of the plants bear two sterile fronds. Occasionally two plants spring from the same root side by side, which gives them the appearance of having two fertile and two sterile fronds.

Botrychium ternatum dissectum Muhl. This is much the same as *obliquum* both in range of size and shape of pinnules, but the latter are cut-edged and dissected, sometimes being only finely toothed and from that extending to deep lacinations of the margin. In its extreme form this is the most beautiful of the varieties. But there can be no question that it is connected by almost infinitesimal gradations with the var. *obliquum*, and that it is utterly impossible to separate it as a species without ignoring entirely the multitude of intermediate forms.

Botrychium ternatum intermedium D. C. Eaton. Why Prof. Eaton gave this form the name of *intermedium* I do not know, unless he regarded it as intermediate in size between our eastern var. *obliquum* and *B. silaifolium* of the west, which he mistakenly called var. *australe*. According to my views, it comes nearer to being an independent species than any of our other forms. It possesses very strong and widely extended roots, from which spring almost equally heavy stipites of both sterile and fertile segments. The leaf is thicker than in other varieties, is more divided than in *obliquum*, and the segments are not so long or pointed. It seems to be quite uniform in size, the plants averaging 12 to 15 inches high, with leaves 5 to 7 inches wide. Occasionally somewhat smaller ones are seen, two or three in my own herbarium, from New Hampshire and the North Woods of New York, being only 6 to 9 inches high, with leaves 3 to 5 inches wide. These, however, are cut correspondingly fine, so that the variety is unmistakable wherever seen. The bud is so densely pilose as

to conceal the folding of the next year's fronds, which fully agrees with Mr. Davenport's description of the bud of *ternatum*. Dr. Haberer says it is later in maturing than the other varieties.

Botrychium ternatum ONEIDENSE var. nov. Plants 10 to 13 inches high, stipites separating $\frac{1}{2}$ to 1 inch above the root, both



Lowest pinna *Botrychium ternatum* Oneidense; $\frac{1}{2}$ natural size.

stipites stout, but not as strong as in var. *intermedium*. Stipes of leaf 3 inches long, leaf 3 to 4 inches long, 5 to 6 inches wide; pinnules of lower pinnae 1 to $1\frac{1}{2}$ inches long, $\frac{1}{4}$ to $\frac{3}{8}$ of an inch wide at base, sometimes deeply pinnatifid; stalks of lower pinnae each with 3 to 4 rounded lobes cut nearly to the costa, and a terminal one; lobes round-ended, generally entire but very faintly toothed. This is the least divided form of the species and

is apparently the least common. It was found in only two localities, on the flat of a stream in Deerfield, Oct. 15. Years ago I found the same form in the Mohawk valley; and in 1898, after Dr. Underwood had published his monograph on the ternate *Botrychia*, I sent him a tracing of the plant, asking him where it should be placed. He answered as follows: "Whether your tracing labeled 'Mohawk river plant' is an enlarged form of same (sub-var. *intermedium* D. C. E.), or is Eaton's northern N. Y. type of his var. *australe* I cannot say. It does not match either, nor is it typical *obliquum*." I have waited thus long to have some one give the variety a name and description, as it has doubtless been found in other localities; but these plants having come into my hands, it seems to have devolved upon me to name it. So I have given it a title which will show that the type came from Oneida County, N. Y.

In this variety the tendency to be ternate is not always so pronounced as in var. *obliquum*. Sometimes it seems to be almost regularly pinnate, and sometimes the basal pinna is $\frac{1}{2}$ inch lower on the rachis than the one that should be opposite.

There is no doubt that the ternate *Botrychia* are long-lived plants, and increase in size from year to year. But even the first year they produce a little spike of fruit which corresponds in size and development with the little ternate leaf. Apparently they

develop their varietal tendencies at an early age, as some of the smallest specimens of *dissectum* show a more marked lacination than many of the larger specimens.

No attempt has been made to consult the large herbaria for comparisons, as it was believed that, for the varieties represented, no additional information could be there obtained. The collection stands by itself and is its own best witness to the facts which it teaches. Nearly every specimen is accompanied by its root and there are not more than three or four leaves without their sporophylls. Where Dr. Haberer took one specimen he left a large number of others, and as these all came from five or six localities it is evident that the *Botrychia* must be exceedingly abundant in this part of the country.

Clayville, N. Y.

POLYPODIUM INCANUM.

BY THOMAS MEEHAN.

WHEN we note a germinating seed of a *Tillandsia* on the smooth bark of an orange plant, and observe the attachment of the young seedling to the branch, the term epiphyte has full significance. But when we attempt to cultivate them we find that though they will live for a year, sometimes two or more years, a new bud must develop and attach itself to the bark of the block on which it is fastened before it becomes a thriving individual again. In other words, they are not merely epiphytes, but in a certain sense saprophytes, if we may properly apply this term to chlorophyllous plants.

I am inclined to place *Polypodium incanum* in this class. I have frequently brought plants from the South, but for all my practical knowledge, have never had one to live. I have carefully detached masses from trees or shady rocks, without seeming to disturb anything in the mass, and endeavored to imitate exactly natural conditions, but failed.

Some two years ago a member of my family brought from Florida a mass of *Epidendrum cochleatum*, in which were growing a seedling *Tillandsia utriculata*, and a very healthy set of plants of *Polypodium incanum*—all woven together in a mass of decayed *Hypnum*s. It was tightly fastened to a bark-covered block, but died, though the other two are still flourishing. In these creeping plants new roots are only formed at the apex of the growing rhizome, and the attachment must be made at that period.

The old roots, torn from their attachment, are deprived of the food they derived from the old bark. The plant died of starvation. Is not this conclusion justified by the facts?

On account of the other plants, the block has remained in the conservatory. Last fall myriads of spores of the fern germinated on the surface of the dead moss. It is safe to say there are thousands. Their development has been a source of great interest. The plants are now in their third frond from the prothallus, and range from half an inch to an inch in length. They would delight the heart of a species-maker. Some of the fronds of the third series are almost sessile, others have stipes half an inch long. In others the phyllous section of the frond is broadly ovate, in others linear. Most are entire, but a large number are equally bilobed, others unequally bilobed, others again presenting but a large tooth on one side. The margins in some cases are ciliate, in others quite entire. In brief it would be difficult to find two plants among this vast number exactly alike, while the extremes would hardly be regarded as of the same species if growing in separate masses by themselves. It must be remembered that all these are from a single plant, and as hybridization can only occur when the plant is in a purely prothallic condition, and no other kind near where these were forming, hybridization as a factor in these variations is out of the question. Nor can conditions of environment be called in for an explanation.

But my main object is to draw attention to the supposed epiphytic habit of this fern, and other supposed "air plants" by the suggestion that they may be a little more than epiphytes after all.

Germantown, Phila.

I would like to record the fact that the spores of *Aspidium simulatum* are undoubtedly capable of germination. I sowed some last winter in a flower pot on thoroughly sterilized earth. In about eight weeks prothallia appeared in large numbers. Unfortunately, some time afterward, but before plants could develop, the sun slightly dried the surface one morning and every prothallus perished—another instance of the fragility of young prothallia.—*Margaret Slosson.*

"The sent of ferne is very gratefull to the braine."—*Parkinson.*

THE CLIMBING FERN IN SPRING.

BY C. F. SAUNDERS.

WHEN in the sunny swamplands the white birches are in tassel, and the red maples, heavy with ruddy fruit, blaze like flames of fire; when the mats of pyxie that closely carpet the sand in damp pine barrens are starred with the last pale blooms of the season, and the sundew, encouraged by the hum of the early gnats, is busily preparing new year's traps in the

bosom of the old year's brown remains,

to the piping of the peepers in the marsh; when the woolly fiddleheads of the cinnamon fern are uncoiling a foot above the earth, and the claws of the bracken's young fronds are clinched in air like the fists of a drowsy man stretching himself out of a sound sleep—in short, about the last of April, the tiny croziers of the Climbing fern (*Lygodium palmatum*) are shyly pushing their round heads up through the sand and moss in thickets along the banks of swift-flowing, resinous streams in the New Jersey pines. At that season of the year, the collector, if he be not already familiar with the habits of the plant, will probably be surprised to find that the fronds of the previous year have persisted through the winter.

Indeed, of all our so-called evergreen ferns, the fronds of none seem to come out of the battle with snow and ice in better order than do those of this most delicate looking species and its diminutive cousin, *Schizea pusilla*. Specimens of the *Lygodium* collected by the present writer on March 31, 1899 (after a winter of exceptional severity for this latitude, during which the mercury on several consecutive days sank below zero), were as fresh and lively in color as they had



Croziers about 3 weeks old.

been the preceding autumn, except that the fertile ends were now

dry and brown. In the hoods of the indusia there was still an abundance of unbroken sporanges. A month later, April 29, when the new shoots were noticed as just appearing, the old leaflets—veterans of a hundred freezing nights—were commencing to look a trifle sallow and some were shriveling and blackening about the edges. As with the traveler in the fable, over whom the elements strove for supremacy, the sun's hot beams were subduing this fern which the winter's bitterness had been powerless to spoil.

Two weeks later, on May 13, the crosiers had lengthened out several inches and were beginning to show pinnules—kidney-shaped in outline, the edges revolute and with shallow lobings that marked the early stages of the "fingers" of the mature leaflets. The accompanying sketch illustrates the forms of the early foliage. It is drawn from the young fronds of a plant which was brought into the house in November, potted in its native sand and sphagnum and given a little trellis to twine upon. Thus humored, it kept alive and served through the winter as a beautiful and interesting ornament in a window-seat, putting up in March (several weeks earlier than the out-of-door plants) the new fronds of the season.

Philadelphia.

FERNS AND ALLIES AT UNALASKA AND NOME CITY.

BY J. B. FLETT.

IT was my good fortune to visit Unalaska June 15-20 last summer, and although the season was too early for mature ferns, judging from the manner in which they were coming up I should say that Unalaska must be a "fern-lover's paradise." They were everywhere—in grassy places, on the rocks, among heather and Lycopodiums, on the hills and in the valleys.

I collected *Polypodium vulgare occidentale* near the settlement of Dutch Harbor, where it was growing very abundantly. It was also observed on crags along the seashore. It differed from our Washington form in texture and shape, having some resemblance to *P. Californicum*. I am inclined to believe that if all the forms were properly classified there would be many well-defined varieties. The Washington form is confined to the rocky summits of high mountains.

Asplenium cyclosorum was just unfolding. It was very abundant in grassy places at sea-level. In the same stage of de-

velopment, though less abundant, was *Phegopteris phegopteris*, which was confined to the streams flowing down the mountain sides. *Cystopteris fragilis* was common along the rocky bluffs forming the seashore. *Polystichum lonchitis* grew on the mountain peaks at an altitude of 1,200–1,800 feet. A form of *Dryopteris spinulosa* was common at sea level, growing in the same habitat as *A. cyclosorum*, and a small *Botrychium*, perhaps *B. boreale*, was seen at sea-level and in the mountains. *Equisetum arvense* was common at sea-level and in moist places higher on the mountains. In the swamps grew *E. variegatum*. This did not seem to be very common, nor did it grow in as dense tufts as it did in the vicinity of Nome City.

The following Lycopodiums, all of which were common, were collected on the mountain slopes: *L. selago*, *L. annotinum pungens*, *L. clavatum*, *L. Sitchense* and *L. alpinum*. The mountain slopes were decorated with these plants and a small dogwood resembling *C. Canadensis*, besides many other flowering plants.

We sailed from Dutch Harbor June 20 and arrived at Nome City June 23. The country here may be divided into three areas: first, the tundra; second, the narrow belt connecting the tundra with the mountains; third, the mountains.

In the first of these areas there are no ferns. *Equisetum variegatum* grew in dense tufts along the sluggish streams, and *E. arvense* was observed both on the tundra and seashore. *Lycopodium selago* grows all over the tundra. It did not resemble the rank growth of the Unalaska form, but was very short and rigid with only a few stalks coming up in a place, and I thought it must be a different species. The above mentioned comprise the Pteridophytes of the first area as far as observed.

In the second area grew *Equisetum silvaticum* and *E. arvense*, both quite common. *E. silvaticum* differed from the eastern form in being slenderer and more branched. Several of the Lycopodiums above mentioned were observed here in the shade of the alder and willow. *Cystopteris montana* grew in the grassy places among the shrubs. It was quite abundant at the base of Anvil Mountain, five miles north of Nome City, though seen nowhere else. A form of *Dryopteris spinulosa* grew in a rather stiff, rigid manner in open places among rocks. It attained its highest development in the shade. In similar situations grew

Phegopteris phegopteris, but the latter seemed to flourish even better on the side of the mountains in grassy places.

The third area was the richest in ferns. *Cystopteris fragilis* was common in the crevices of the rock peaks, as was *Woodsia ilvensis* in similar situations. Both were found near the summits.

Woodsia glabella was seen only on Anvil Mountain. It grew on the terraces among grass and heather, occurring rather sparingly from the base to near the summit. *Cryptogramma acrostichoides* grew in talus at the base of cliffs. It was nowhere very abundant, nor was it quite as large as the form in the States. At the base of the mountains in rock-slides among immense slabs of mica schist *Dropteris fragrans* found a hiding place. I extracted the first specimen with great difficulty, having to reach down into a deep, almost perpendicular crevice. I had to get a firm hold with my toes back of a rock in order to pull myself out of the place. It was not very abundant, though dwarfed forms were seen near the summit at an altitude of 700 or 800 feet. Here the new species, *Dryopteris aquilonaris*, was discovered. It grew in the crevices of solid rock along with *Woodsia ilvensis*, *Dryopteris fragrans*, *Cystopteris fragilis* and *Phegopteris Dryopteris*. It is related to *D. fragrans*, but easily distinguished from it, being smaller and more graceful.

Tacoma, Wash.

THE GENUS EQISETUM WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON.

SEVENTH PAPER.

E. SILVATICUM L.

STEMS dimorphous; fertile erect, 3-18 inches high, 2"-3" in diameter, at first naked, but soon producing, from the two or three upper nodes, verticils of recurved decompound branches which last through the season; internodes 5-15, brownish, mostly smooth, grooves broad and shallow, developing a double row of stomata on each side as the season advances; sheaths large, 4"-10" long, ventricose, with spreading top; leaves rounded on back or slightly grooved when dry, gradually passing into thin russet teeth which equal them in length and are connate into 3-4 groups; central cavity a little more than half the diameter of stem; spike conical 1-1½ inches long, usually raised on a fleshy peduncle.

soon maturing an abundance of green spores, then withering; sterile stems taller, thinner and with shorter but more numerous internodes; carinae more pronounced, flat, with a row of single or rarely double hooked teeth or bristles on each side; sheaths shorter, firmer, green to the teeth; the 4-6 lower internodes usually naked, the upper with dense verticils of branches which at first are arched with drooping tips, but gradually straighten as they expand till they are nearly horizontal in shade or even erect in sun. They have 4 or 5 deep grooves and nearly smooth angles, and decrease regularly in size from the base upward, except that the lowest are usually shorter than those next above. Each node produces several 3-4 angled branchlets, some of which are again branched. The sheaths are green with sharp-pointed spreading teeth.

The rhizome is rather less than $\frac{1}{8}$ of an inch in diameter, and is very wide-reaching, at times growing five or six feet in length. It is one of the very few plants that a deep mulch will not kill. When covered to a depth of eight or ten feet with sawdust it will reach the surface in the second year. It is dull, blackish-brown, about 10-angled, sparsely provided with root-hairs and occasionally bears tubercles. Usually a cross-section shows a yellowish ring separating the carinal cavities from the vallicular, and often each carinal one is enclosed in a still smaller ring derived from this. These thickened rings are present in only a few species and are made much of in diagnosis.

This is a northern species. It grows from the highest north in Europe to about 71° N. Lat. In America it is reported from Greenland to Cape Nome, Alaska, south to Virginia and Michigan. It is very common by borders of rich woods, especially in the cold, wet alluvium bordering streams in the forest region. It is rarely met with in cultivated fields and is reputed to be averse to chalk and lime soils. In its favorite habitat it enjoys most those small bogs where wet, poorly drained arms of a swamp encroach upon the evergreen forest, where the shade is deep on all sides, but a diffused light filters from above. Here the fine green branches reach out in a veil-like network, each verticil a little smaller than the one below, and the top of the stem curves gracefully away toward the shade, thus bringing all into fullest relief. In drier situations the stem is less prominently curved, and the branches more ascending, till often in the sun the tips become erect or but slightly divergent. Both forms of the stem start simultaneously in spring, varying in date according to locality, but

the fertile grow more rapidly. The spores mature early, after which the spike decays and the remaining portion of the stem becomes like the sterile in appearance. Probably the 15th of May is a fair average time for the fertile stems, but the sterile do not mature till a month later.

VARIETIES.

This species presents no very well-marked varieties, most differences noted being degrees of development directly traceable to environment. Most striking forms of any species receive names and the residue is apt to be looked at as the type. This is not the true light in which to consider the question, for obvious reasons, unless we adopt the view that all the forms are necessary to constitute the species, when the type is apt to sink into secondary rank. Of the named varieties we appear to have seven, two of the fertile stems and five of the sterile, as follows:

1. *Præcox* Milde. Fertile stem fuscous and naked at first, later becoming green and branched. Found usually in open pastures by water courses. This appears in its earliest stages like *E. arvense*, but the long, thin ventricose sheaths easily distinguish it. Rarely a stem of this variety fails to put forth branches at all, and then soon perishes. I have seen them with one very small branch. From this they vary up to the normal form, in which, however, the branches appear before the spikes mature.

2. *Serotinum* Milde. Stems usually small, with 6-8 verticils of recurved branches and terminated by a very small spike, of 4-6 rows of sporophylls. A transformed, sterile stem, corresponding to the variety *campestre microstachya* of *E. arvense*. Ascribed to Labrador by Milde, who says it is rare. I find it not uncommon in open pastures, where special search is made for it, and it is occasionally found even in rich moist woods, where the stem is taller and often curved at top, as in normal sterile stems. It appears to be absent from some localities, nevertheless. Most common in firm, grassy soil.

3. *Robustum* Milde. Stem yellowish, erect, rigid, naked below; branches arched and ascending, with short secondary branchlets, which in turn bear a few short branchlets. This form grows in sunny fields, its rigid habit and ascending branches being due to direct sunlight. It is often found also in recent clearings. Not always of large size.

4. *Capillare* Hoffm. Stem 1-2½ feet tall, erect, with recurving apex; branches and branchlets capillary, horizontal spreading,

not recurved except occasionally at the very tips. In undrained black soil in shady woods; the most perfectly developed form and one of the most beautiful plants we have. In striking contrast to the last form.

5. *Pyramidale* Milde. Stem pyramidal, branched from base; lowest branches longest, often 6-angled, and with well-defined central cavity, the upper successively shorter to the top. In cultivated fields and hard soil, always in sun. Rare. I have met with this but once.

6. *Pauciramosum* Milde. Stem erect, naked below, nearly smooth, branches sub-simple. Described from specimens from Labrador. I have seen but one specimen of this, in deep, wet woods, Kensington, N. H. It resembles a branch of the ordinary form, but is larger, 7-12 inches tall, and 6-8 angled. It is probably caused by a cold, wet soil.

7. *Squarrosus* A. A. E. Fruit sessile or nearly so, persistent; sterile stem lanceolate in outline, erect at tip, often bearing an abortive spikelet; branches decreasing from center both ways, horizontal or becoming erect, ultimate branches often torulose, the teeth squarrosely spreading or reflexed. Among alders and in willows 16 miles west of Nome City, Alaska, Aug. 5, 1900, J. B. Flett, No. 1,524. The torulose branches, erect persistent spike and squarrose teeth give this a peculiar appearance. The outline of the sterile stem is also characteristic; its chief peculiarity, however, lies in the proneness of the sterile stems to end in a green abortive spikelet. This form corresponds to var. *serotinum*, but in that the spike is normal, though small, and is fleshy and sporiferous.

MONSTROSITIES.

This species with us appears to produce few monstrosities. They appear to occur oftener in Europe. Milde describes a var. *polystachya* in two forms, one being the ordinary fertile stem with seven spikes situated in the upper sheaths; the other form was sterile with 28 spikelets on the tips of the branches. He had seen but one of each. He also mentions and elsewhere figures a var. *bi-multiceps*, with spikes forked and digitate; a var. *furcatum*, with both kinds of stems forked; and a var. *proliferum*, with spike terminated by a sterile branch. I have seen none of these except one sterile stem of the second, but mention them as they are liable to be found at any time. Another form, not dignified with a name, bears branches directly under the spike and may

often be found with one-half the annulus normal, the other half developed as a normal sheath and bearing branches.

Seabrook, N. H.

[Sets of the forms illustrating this species were sent out in January with the sheets of *E. Telmateia*. Complete sets from the beginning of this series may be obtained by applying to Mr. Eaton at once. In the article on *E. palustre* the New Jersey station for it should read Closter, N. J.—ED.]

BOTRYCHIUM MATRICARIAEFOLIUM A. Br.*

BY GEORGE E. DAVENPORT.

SOME specimens of this species recently received from Berlin through Mr. Greenman show how wholly indefensible is the position which Dr. Underwood has taken in the latest (6th) edition of his "Native Ferns" on the status of our American plants.

It is difficult to understand how he could have made such rash statements as those which intimate the non-existence of this species in the United States, and that, too, in the face of the fact that nearly all European authorities have recognized the identity of the European and American plants.

Luerssen cites "Onondaga County in New York," as well as "Unalaska" and "Canada," thus showing that he recognized our American plants as being identical with the European. One has only to compare the admirable figures of European forms in Luerssen's "Die Farnpflanzen" with a series of forms from any part of the United States or Canada to be convinced of their positive identity. That the species has been much confused with *B. lanceolatum*, *B. lunaria*, *B. simplex* and even *B. ternatum*, at times, there is abundant evidence to show, but the following brief summary of the more important data stands out clearly in its history:

The species appears to have been known to Breyn as *Lunaria matricariaefolio* (Cent. 1, T. 94, 1673), and to have been referred to *Osmunda lunaria* as var. *y* by Linnæus in 1755 (Flora Suec., Ed. II., p. 369). From this time until Braun brought out its distinctive character more clearly in Döll Rhein. Flora (1843) under Breyn's name of *matricariaefolio*, the species and synonymy are so badly mixed up that very little importance can be attached to them, and Braun's name, *Botrychium matricariaefolium*, becomes

*Read before the New England Bot. Club March 1, 1901.

the first legitimate combination of generic and specific names entitled to serious consideration.

At the time of the publication of Wood's *Botrychium neglectum* the genus was very little understood in this country, and Wood was apparently unacquainted with the European *matricariaefolium*. If he had been he would never have published his *B. neglectum*, as he was too good a botanist not to have seen that his plant was identical with Braun's species. (This may be a gratuitous assumption on my part, but I cannot reconcile his publication of *B. neglectum* with any other theory.) *

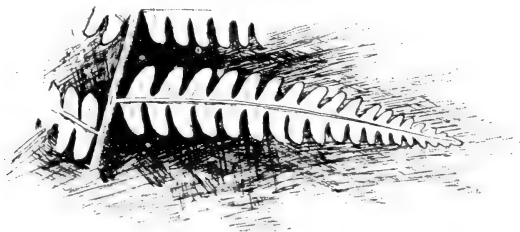
The disposition manifested in some quarters to recognize mere geographical differences, instead of fundamental organic characters in the plants themselves, as a basis for specific distinctions, is something that I cannot appreciate, as it seems to me utterly subversive of the true principles of scientific investigation. The mere fact of two plants being found growing in widely separated sections of country, even though the ocean does roll between them, is not of itself a good reason for considering them distinct species. *

Medford, March 1, 1901.

HELPS FOR THE BEGINNER.*

IV.—THE FLOWERING FERNS.

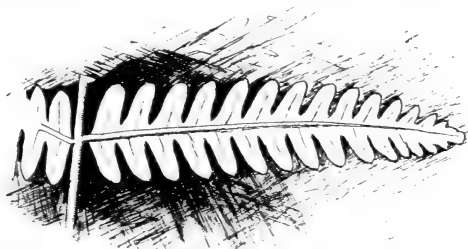
THE flowering ferns—the species of the *Osmunda* family—are among the most common and conspicuous of the species in Eastern America, and so well known that any directions for identifying them seem almost superfluous. The tall and graceful fronds in circular clumps are characteristic sights in nearly all swampy grounds, and few are more beautiful.



Sterile pinnule of *O. cinnamomea*.

*Begun in July, 1900. This series will include all the American ferns.

The farmer and the non-botanical rambler are accustomed to call them "brakes," and the opinion is current in many places that a "brake" is not a true fern. Botanists, however, make no such distinction. This fern family differs from others in bearing spore-cases that have only the rudiments of the elastic ring that encircles the spore-cases of the Polypody family, and are further distinguished from most of our other ferns by fruiting in spikes and panicles instead of on the backs of the fronds. From this circumstance they are called flowering ferns. All fruit early in spring at the time the sterile fronds are unfolding. The fruiting parts eventually become rich brown in color, but the spores are bright green. Of the three American species, the Royal fern (*Osmunda regalis*) is not easily confused with any other species. It has smooth cool-green twice-pinnate fronds with entire leaflets resembling somewhat the leaves of the locust tree. The Cinnamon fern (*O. cinnamomea*) is easily distinguished from the interrupted fern (*O. Claytoniana*) when in fruit, but the sterile fronds



Sterile pinnule of *O. Claytoniana*.

are easily confused. The pinnules of the cinnamon fern, however, are more pointed, and the fronds themselves are narrower and more erect than in the interrupted fern. The cinnamon fern, too, usually has a little tuft of wool at the base of the pinnæ. The following key should enable the beginner to separate the species:

- Tall ferns in circular crowns fruiting early in spring.
 - Fertile and sterile fronds separate, the latter bi-pinnatifid, pinnæ pointed, *O. cinnamomea*.
 - Fertile pinnæ in the middle of fronds otherwise like the sterile, the latter bi-pinnatifid, pinnæ and pinnules blunt, *O. Claytoniana*.
 - Fertile portion in a terminal panicle. Fronds twice pinnate, *O. regalis*.

—W. N. C.

SOUTHERN EXTENSION OF THE RANGE OF POLYPODIUM SCOULERI.

BY S. B. PARISH.

ALMOST all the California ferns are rupestrine, and possess other characteristics indicative of the aridity, greater or less in degree, with which they have to contend. The most marked exception to this prevailing rule is *Polypodium Scouleri*. Although this sometimes grows in the soil, its usual situation is the mossy trunks of trees, a habit shared by no other Pacific-coast fern, and restricting its possessor to a climate at once moist and warm. Accordingly it is confined to the coast region, from as far south as Santa Cruz county*, and thence northward into Oregon; its range closely coinciding with that of the redwood (*Sequoia sempervirens*, Endl.). This district alone possesses a mild climate in conjunction with a copious rainfall, heavy ocean fogs and humid atmosphere; and by these conditions the continental distribution of this fern is very closely limited.

But some 250 miles south of the southernmost point which it reaches on the mainland a group of three islands lies within sight of Santa Barbara county, the most distant bearing the name of Santa Cruz Island. Yet further south by 80 miles the island of Santa Catalina is to be seen opposite the coast of San Diego county; and 250 miles beyond, the lonely Guadalupe rises from the ocean at a distance of 100 miles from the arid shores of the peninsula of Lower California.

The climate of these islands is practically that of the adjacent mainlands. No meteorological observations have been recorded upon any of them, but it is probable that the atmosphere is somewhat more humid, and the fogs heavier, especially on seaward exposures, than on the neighboring coast; yet only in this comparative way can they be said to be humid or foggy. Certainly they have little, if any, greater share of the winter rains, and their summers, if somewhat cooler, are equally rainless.

The flora of the islands is of great interest, and may be divided into three groups. The largest group consists of plants identical with those which grow on the neighboring mainland, although in some cases so much more luxuriantly developed as to have received names as varieties, or even as distinct species.

The second group is made up of a considerable number of

*Clark, F. L. Cat. Fl. Pl. & Ferns Santa Cruz Co., 13.

strictly endemic plants, some of which are without other even generic American representatives. Thus this extreme western fringe of the continent has no less than four endemic species of *Lavatera*, a genus unknown elsewhere in all America, North or South. The monotypic *Lyonothamnus floribundus* Gray, a saxifragaceous tree, is found on three of the islands, and nowhere else in the world; and *Erythea edulis* Watson, a palm of a genus in which there is but one other species, is confined to the island of Guadeloupe.

The third group, and much the smallest, contains a few plants which on the islands attain a more northern extension of their range than on the continent. An example of these is *Lycium Streetsii* Gray, a species of Lower California, which is represented on Santa Catalina Island. On the same island is found *Crosso-soma Californica* Nutt., a species hardly distinct from that which inhabits Arizona and the Colorado Desert. These give emphasis to the undoubted fact that the relationship of the island floras, like that of the flora of the neighboring continental regions, is with the south, and not with the north.

Such being the geographical position and the climatic conditions of the islands, and such the affinity of their floras, we find in *Polypodium Scouleri* the single exception: a northern plant which has been able to extend its limits far south of that which it has reached on the mainland, and into a different phytogeographical area.

The fern has been reported from three of the islands. In 1889 Dr. Yates found it on Santa Cruz Island, "growing luxuriantly among the projecting fragments of volcanic rocks, at the mouth of one of the most interesting caves on the island."* Dr. Yates has favored me with specimens of a subsequent collection, made in August, 1893. These are characteristic, but smaller than most mainland specimens of this fern.

Two records have been made from Santa Catalina, one by Mr. Brandegee,† and the other by Mrs. Trask;‡ yet the presence of the fern on this island, while not improbable, is not certain. There are no specimens of it from the island in Mr. Brandegee's herbarium, or in the herbarium of the California Academy of Sciences; while Mrs. Trask's specimens of the plant, both as rep-

*Yates, L. G., Bull. Santa Barb. Soc. Nat. Hist., 1:9.

†Brandegee, T. S. *Zoe*, 1:115.

‡Trask, Blanche. *Eryth.*, 7:142.

resented in the Academy herbarium and by others, excellent samples of which she kindly communicated to the writer, are really vigorous forms of *P. Californicum* Kaulf. Neither does it appear to have been met with by any of the other botanists who have collected on this island. Its reported presence must, therefore, be regarded as needing confirmation.

The case is very different with regard to Guadeloupe, although it was collected by only one of the three botanists who have visited that island. Not only is the identification vouched for by such eminent authorities as Dr. Watson and Dr. D. C. Eaton, but the collector's field-note alone would be conclusive. Dr. Palmer found it "encircling the trunk of a single oak, in a thick mat of moss, and constantly wet by the fogs, covering* the tree with a network of its strong, tough roots to the height of ten feet." §

The fern, then, has reached this solitary island, 600 miles from its nearest continental station and over 300 miles from the nearest authenticated insular station. An inhabitant normally of the Pacific coast life-area, it has intruded far down into the Sonora province. How and when did this migration take place? For a genuine migration it must have been, since this is not a plant that, in any probability, might have been conveyed fortuitously to distant shores by currents of wind or water, or by birds.

Geology, perhaps, furnishes an answer. For in the opinion of geologists, these islands are the emergent peaks of a mountain chain, paralleling the present coast-line, and connected with it by a broad valley, over which the waves now roll. At that distant time a more moisture-laden atmosphere might easily have induced some northern plants to journey southward along the mountain range. If such emigrants these were, *Polypodium Scouleri* is the sole survivor. That it is a lingering survivor is indicated by its great rarity, only two among the visitors to the islands having found it, and they, as is shown by their field-notes, each at a single point, and under exceptional conditions, where it probably awaited impending extinction.

San Bernardino, Cal.

§ Watson, S. *Proc. Am. Acad.*, 11:120. See also Eaton, D. C., in Watson, *Bot. Cal.*, 2:355.

—The Torrey Botanical Club has begun the publication of a second monthly journal named *Torreyia*. Dr. M. A. Howe is editor.

A LIST OF THE FERNWORTS COLLECTED IN JAMAICA*

BY WILLARD N. CLUTE.

(Continued.)

CHEILANTHES Sw.

71. *C. microphylla* Sw. Abundant. Found on dry rocks and walls, as well as in shady places. On the north side of the island it frequently envelopes the stone fences. (243).

PTERIS L.

72. *P. pedata* L. On dry banks at Gordon Town, rare. This is easily mistaken for *Pellaea geraniæfolia*, and I saw specimens so marked in Kingston. (301).
73. *P. longifolia* L. Abundant on dry banks from sea-level to the mountain-tops. (88).
74. *P. grandifolia* L. Common at slight elevations. Gordon Town. This is a magnificent fern. It is simply pinnate, often ten feet long and nearly three feet wide. In wet shades. (40).
75. *P. quadriaurita* Retz. Plentiful at Cinchona. (133).
76. *P. podophylla* Sw. Common at Morce's Gap and elsewhere in the mountains. A fern of striking aspect, the stipe erect, often as tall as a man, bearing a flat-spreading star-like frond which is often a yard or more across. (204).
77. *P. laciniata* Willd. A large and fleshy species, almost an exact image of *Lonchitis aurita*, both in fruiting and in the cutting and vestiture of the fronds. Cinchona, not common. (186).
78. *P. incisa* Thunb. Openings in the woods at New Haven Gap. Not common. Has much the aspect of the Bracken in the Northeastern States. The foliage is a light blue-green and appears as if covered with bloom. (109).
79. *P. heterophylla* L. Common at Bath Fountain. Has considerable likeness to our *Pellaea gracilis*, but larger. (284).
80. *P. caudata* L. Abundant on all the upland slopes in full sun. Fronds eight feet or more tall, the pinnæ spreading in all directions. Not ternate. (182).

*Begun in July, 1900.

(To be continued.)

EDITORIAL.

MR.

DAVENPORT

We have the pleasure of presenting in this issue the latest portrait of Mr. George Edward Davenport, one of the best known of living fern students. Mr. Davenport was born in Boston Aug. 3, 1833, and early became prominent among his fellows for his papers on the botany of his State. He was one of the founders of the Middlesex Field Club, which later developed into the Middlesex Institute, and was for a time one of its officers. In 1872 he joined the Massachusetts Horticultural Society, and three years later presented to it his collection of ferns now known as the Davenport Herbarium. In acknowledgement of this gift he was voted the Appleton Gold Medal and a life membership in the Society. Mr. Davenport is also a Fellow of the American Academy of Arts and Sciences and a member of the New England Botanical Club and many other scientific societies in his own and other cities. Although flowering plants have claimed much of his attention, he is probably best known for his work on the ferns. Among his most valued contributions to this branch of the science are "A Monograph of *Botrychium simplex*," "Vernation of *Botrychia*," "*Aspidium spinulosum* and its Varieties," "*Filices Mexicanae*" and "Fern Notes," the last two published serially in botanical journals, describing and figuring many new or rare species. He has also elaborated the ferns for many special publications, such as the "Contributions" from the National Herbarium and from the Field Columbian Museum. At present he is preparing a Manual of the Ferns of North America, as well as a less technical work for schools.

NOTES.

—We note a continuance of the articles on "Ferns and Fern Allies" in *Nature Study*. Six articles have now appeared.

—The March number of *Meehan's Monthly* contains a colored plate of *Equisetum arvense* and two pages of descriptive text.

—The Philadelphia *Record* for Dec. 16, 1900, contains an entertaining article by C. F. Saunders on "A Fern Hunt in Winter."

—In *Rhodora* for January Mr. G. E. Davenport describes and figures a plumose form of *Asplenium ebeneum* which he names *Hortone*. It was found in Vermont.

—In the death of Mr. Thomas A. Williams, on December 23, 1900, the *Asa Gray Bulletin* lost its senior editor and the journal has now been merged with the *Plant World*.

—Mrs. E. G. Britton and Miss Alexandrina Taylor have contributed an exhaustive study of the life history of *Schizaea pusilla* to the January *Bulletin of the Torrey Botanical Club*.

—In "Notes on the Genus *Lycopodium*" in the January number of *Torrey* Prof. F. E. Lloyd writes that the denticulation of the leaves is of small diagnostic value in the group of which *L. alopecuroides* is the type.

—Under the title of "The Home of *Botrychium pumicola*," Mr. Frederick V. Coville gives a full account of this new species in the *Bulletin of the Torrey Botanical Club* for February. Three good figures of the fern are given.

—In the January *Bulletin of the Torrey Botanical Club* Prof. Underwood describes a new species of *Adiantum* from Mexico as *A. modestum*. It is much like *A. Capillus-Veneris*, differing in the smaller, rounded and less incised pinnules, narrower sori and lighter colored rachids.

—In an article on "The Ferns of Mt. Toby" in the March *Rhodora*, M. L. Owen notes that *Botrychium simplex* shares with *Ophioglossum vulgatum* the habit of disappearing for a season. Eight hundred specimens of the *Botrychium* were found one year in a space ten rods long and seven wide.

—Last summer Mr. J. B. Flett made a collecting trip to Alaska and returned with 23 species of fernworts. These are listed by Mr. W. R. Maxon in the *Bulletin of the Torrey Botanical Club* for December. A form of *Aspidium fragrans* is described as new under the name of *Dryopteris aquilonaris*.

—In reprinting Mr. C. T. Druery's list of "Abnormal British Ferns" from *Indian Gardening* in our January number, we changed the generic names *Lastrea* and *Nephrodium* to *Dryopteris* in conforming to American ideas of nomenclature. The reprinting of our Americanized list by British papers, however, makes it appear as if Mr. Druery had changed his mind regarding these names. This he emphatically disclaims, and we hope this explanation may set matters right.

—By an inadvertence the January FERN BULLETIN made the statement that *Lycopodium annotinum* (instead of *L. inundatum*) was found on southern Staten Island in company with *L. alopecu-*

roides. *L. annotinum* is more of a mountain form and not likely to be found near sea level, at least so far south. It may be noted in passing that the spores of *L. alopecuroides* and *L. alopecuroides adpressum* are not shed until very late in the year. In the first week of October they were sending out clouds of spores at the slightest touch.

—The *O. S. U. Naturalist* has changed its name to the *Ohio Naturalist*—a very commendable step.

BOOK NEWS.

Dr. C. C. Abbott's latest book, "In Nature's Realm,"* comes from a new publishing house, and in both literary and mechanical qualities is well calculated to establish a reputation for excellent book-making. The author is familiar with all sorts of living things and his observations regarding them are always entertaining. In the present volume such subjects as "Views Afoot," "A Cheerful Fog," "Nine Spring Corner," "Sour Grapes," "A Fence-rail Fancy" and "A Marsh Madrigal" engage his attention. The book, which is printed on deckle-edged paper and handsomely bound, is embellished as well as illustrated with nearly a hundred drawings of birds, insects and reptiles mentioned and of the places they inhabit.

At the meeting of fern students in New York, last June, eight papers were presented. Five of these have now been published under the title of "Fernwort Papers,"† uniform with the report of the Boston meeting. In this new pamphlet Mr. Eaton discusses the genus *Isoetes* in New England, and describes four new species and one variety; Prof. Underwood presents some observations on the system of arranging the ferns proposed in "Die Natürlichen Pflanzenfamilien;" Miss Slosson records some experiments in hybridizing ferns; Mr. Gilbert argues for the recognition of *Athyrium* as a genus, and Mr. Maxon gives an account of the American localities for the Hart's tongue. The pamphlet marks another step in the advancement of the Fern Chapter, and will be of interest to all who love ferns.

*In Nature's Realm. By C. C. Abbott. Trenton, N. J. Albert Brandt, 1901. 8 vo., 305 pp., \$2.50 net.

†Fernwort Papers. Printed for the Linnæan Fern Chapter. Binghamton, N. Y. W. N. Clute & Co., 1900. 8 vo., 46 pp., 25c.

Those who love to delve in old volumes for the quaint and curious about plants will be delighted with "A Garden of Simples"* by Martha B. Flint. The sturdy Dutch settlers of Long Island and the adjacent territory had many odd notions about the vegetable world, and these have furnished the author with material for a very charming volume. As we read a new interest attaches to "Paas Blumtje" and "Pingster Bloeme," as well as to the commoner herbs that found a place in the old-fashioned garden. Kindred subjects are touched upon in such chapters as "Indian Plant Names," "Midsummer Day" and "Liberty Tea." The publishers, upon their part, have given the book a setting quite in harmony with the time of which it treats, the binding, letter-press and arrangement of matter following closely the standards of book-making recognized a century or more ago.

Books on mushrooms are at present springing up almost as rapidly as the plants of which they treat. One of the latest, as well as one of the best, is "The Mushroom Book"† by Nina L. Marshall in Doubleday, Page & Co.'s Nature Study Series. While thoroughly scientific in treatment, it presents the subject in a manner easily understood by those who make no pretention to a scientific acquaintance with the fungi. There are nearly fifty plates from photographs, many of them colored, and an abundance of other illustrations in the text. A feature new to books of this nature is a key to the families in which a species of each is illustrated. Although called a "mushroom book," a considerable part is devoted to the mushroom's allies—the fairy clubs, Jew's ears, stinkhorns, earth-stars, truffles, earth-tongues, etc.—and forms one of the most interesting sections. Throughout the book a leading place is given to those families containing the more conspicuous or common species, but the others come in for at least a mention. For the purposes of the unscientific reader there appears to be no better book published.

The Frederick A. Stokes Co. have recently issued "A Guide to the Trees"* by Alice Lounsberry, uniform with "A Guide to the Wild Flowers" by the same author. This treats of some

*A Garden of Simples. By Martha Bockee Flint. Charles Scribner's Sons, New York, 1900. 12 mo., 307 pp., \$1.50.

†The Mushroom Book. By Nina L. Marshall. New York, Doubleday, Page & Co., 1901. 8 vo., 165 pp., \$3.00 net.

*A Guide to the Trees. By Alice Lounsberry. New York, Frederick A. Stokes Co. 8 vo., 310 pp., \$2.50.

two hundred species of trees arranged according to habitat. The scientific descriptions are full and accurate and each species is also accompanied by more or less text of a popular nature. The book is illustrated with 64 colored plates and many others in black and white by Mrs. Ellis Rowan. Considering the dull colors and unattractive character of the flowering parts of many of our trees, the artist has succeeded very well in reproducing them in color.

The third fascicle of the "Flora of Northwest America"† recently issued, carries that interesting work nearly through the Compositæ. We have previously noticed its special features, but cannot refrain from again commending the author for his very sensible course in using single author citations and in crediting early genera to those who named them, rather than to Linnaeus. Prof. Howell writes that the fourth fascicle is nearly ready for the binders.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—Mr. W. C. Barbour, Sayre, Pa., offers specimens of *Selaginella apus* to Chapter members who will send him a stamped, self-addressed envelope.

—A copy of Fernwort Papers was sent to every member of the Chapter not in arrears for dues. As long as the supply lasts a copy will also be sent to those who join the Chapter.

—Dr. A. J. Grout offers specimens of *Lycopodium chamæcyparissus* to members. They may be obtained by sending six cents in stamps to President Maxon.

—The following new members have been admitted to the Chapter since January: Messrs. William Frederic Bade, Bethlehem, Pa.; James H. Ferriss, Joliet, Ill.; W. H. Smyth, 101 Sansome street, San Francisco, Cal., and Mrs. Maria Herrick Bray, West Gloucester, Mass.

†A Flora of Northwest America. By Thomas Howell. Portland, Ore., 1900. Pp. 275—386, 8 vo., 50c.

80 cts. per Year
15 cts. per Copy.

Vol. IX.

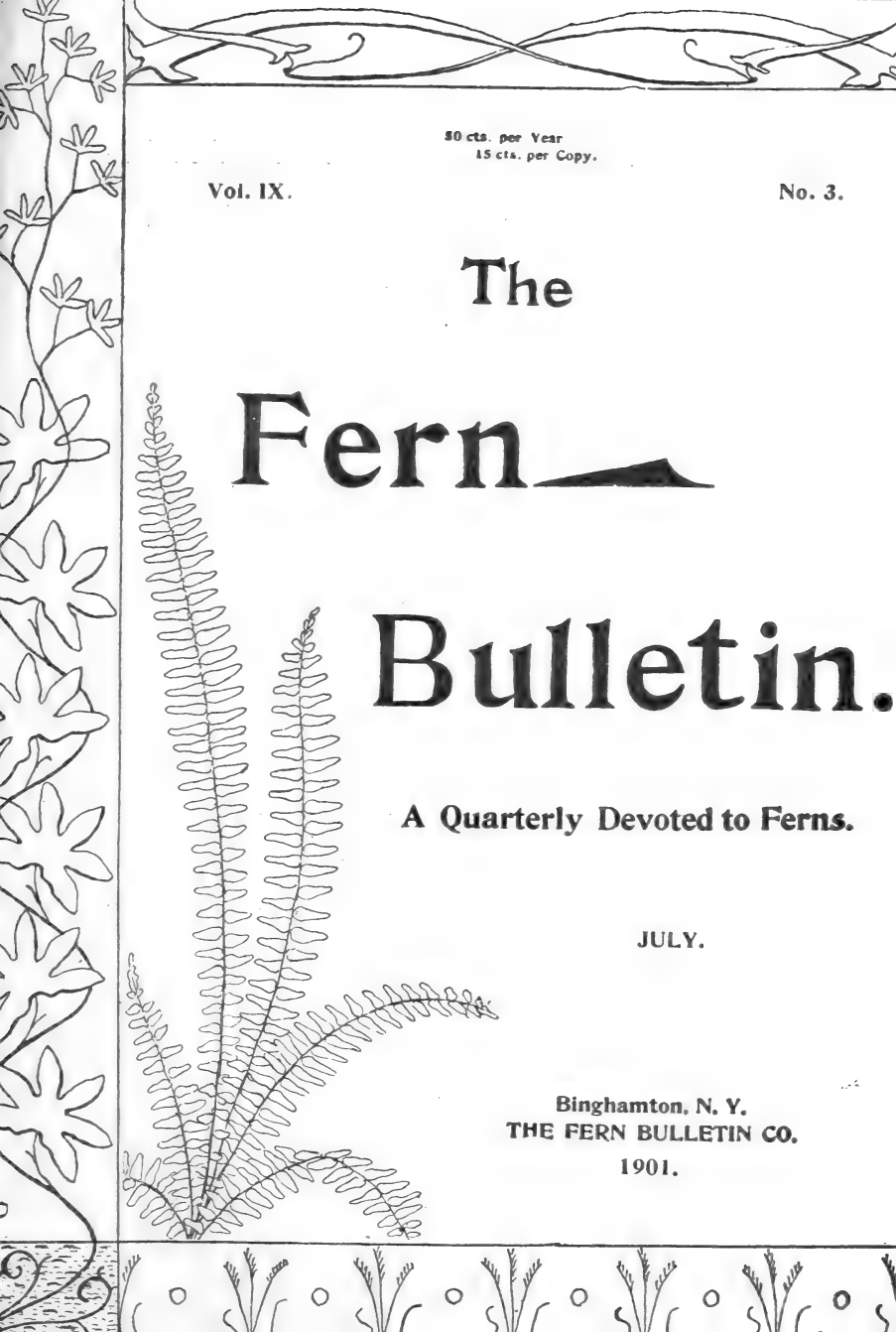
No. 3.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

JULY.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1901.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

15 CENTS A COPY; 50 CENTS A YEAR.

Awarded Grand Prize at the Paris Exposition.

If this paragraph is marked, your subscription has expired. The mark indicates the time it expired as follows:

- | | |
|-----------------------------|----------------------------|
| 1—With the previous volume. | 2—With the present number. |
| 3—With the January number. | 4—With the April number. |
| 5—With the July number. | |

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. All arrearages must be paid.

Personal checks must contain ten cents extra for collection. Otherwise credit will be given for the amount less collection fees.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT. WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information. Members will please send dues to the Secretary.

THE SECOND EDITION

OF THE

FLORA • OF • THE • UPPER • SUSQUEHANNA

Has just been issued. A large number of additions have been made. All who are interested in our local floras should have it. It is not a mere list. Price \$1.50.

Address, Willard N. Clute & Co., Binghamton, N. Y.

WANTS AND EXCHANGES

Special announcements inserted here for One Cent a word. No notice received for less than 25c. No charge for address.

WANTED—Back Nos. of The Fern Bulletin to complete files as follows: Vol. I-III, Nos. 2-7, 11, 12; Vol. IV, No. 1; Vol. V, Nos. 1. O. B. Douglas, M. D., Suncook, N. H.

WANTED—To complete files, Nos. 2-7, 11 and 12 of Vol. I-III, and No. 1, Vol. IV, Linnaean Fern Bulletin, and Nos. 1 and 3 of Vol. V, Fern Bulletin. Any reasonable price paid. O. M. Olson, Fort Dodge, Iowa.

WANTED—*Linnaean Fern Bulletin*, No. 2. C. B. Atwell, Northwestern University, Evanston, Ill.

WANTED—*Linnaean Fern Bulletin*, Nos. 2, 3, 11 and 12 of Vol. I-III. A good price will be paid. E. A. Noyes, 12 Essex St., Newburyport, Mass.



BENJAMIN DAVIS GILBERT

THE FERN BULLETIN

VOL. IX.

JULY, 1901.

No. 3.

A CHANGED CONCEPTION OF SPECIES.

BY LUCIEN M. UNDERWOOD.

TWO pernicious principles early invaded the study of botany in this country and some traces of the spirit they engendered still persist in conservative settlements along with other provincialisms strikingly un-American. These were: (1) The habit of regarding as many American species as possible identical with European congeners; this was natural since the study of botany commenced in Europe rather than in America; and (2) the more or less blind acceptance of European writers on American plants as "authorities;" this has been largely due to ignorance of the paucity of American material for study in the hands of these writers. Combined with these has been the strong tendency to include a wide range of variations under a single specific description, or, to quote the favorite expression of the veteran English fern student, to treat "species in their *broad sense*." Study in recent years and, particularly, close examination of the meager facilities for rational judgment on which some of these European "authorities" have based their conclusions have led to the abandonment of many positions formerly held. We are also discovering that many American and European plants formerly supposed to belong to the same species are really distinct. This is all the more apparent when we can add to herbarium and historical study, the actual observation of plants *afeld* in both countries.

The broad idea of species is rapidly passing away with the more exact study of a wide range of material. Even in conservative New England, where Asa Gray knew only a single *Antennaria*, seven or more species are now recognized even among his own successors in the herbarium at Cambridge, while the blue violets, panicums, and hawthorns have successively expanded to bounds that would cause the botanists of twenty years ago to suffer acute paralysis. An example of the recent expansion of a species "in the broad sense" that will be of interest to

fern students is the group formerly known under the collective name of *Selaginella rupestris*. After seeing the Southern Californian and Floridan development of this plant I was convinced, as field study alone can thoroughly convince one, that *S. rupestris* was a composite species, a conclusion readily reached after the accumulation of a wide range of variations in herbarium specimens. A preliminary study* of the material at hand resulted in the publication of several species with suggestions of more of which available material was too scanty. Dr. Rydberg added another species from his field study in Montana, and Mr. Eaton still another, which, however, proved to be a re-description of an older one of Nuttall—a suggestion that, in addition to careful field study, it is necessary also to see the types of other people. It may be over-cautiousness, but unless a growing plant has been seen, I hesitate to describe it as new without an abundance of material, or unless its characters are so striking as to permit of no question. Others have not the same caution, for Dr. Hieronymus of Berlin, probably the best informed German fern student of the day, has recently made a study of *S. rupestris* from the whole world, in which he separates twenty-six additional species! Of these, ten are from the United States, besides *S. Fendleri*, which he raises to specific rank from my proposed variety. And to my knowledge there is less American material bearing on the subject in the Royal Museum in Berlin than there is in my own herbarium or in any one of at least three public American herbaria. As this publication† is not accessible to the greater number of our fern students, it will not be out of place to summarize the work of Dr. Hieronymus as far as our own species are concerned, especially since Mr. Maxon has omitted them from his list. His species are: 1. *S. Schmidtii*, Unalaska, and var. *Krauseorum*, Alaska; 2. *S. Montanensis*, Montana; 3. *S. Engelmanni*, Colorado (Empire City); 4. *S. Bourgeauii*, Oregon; 5. *S. Haydeni*, Oregon, Nebraska; 6. *S. Wallacei*, "Oregon," but probably collected within the limits of what is now Washington; 7. *S. Wrightii*, New Mexico; 8. *S. Bolanderi*, California (Auburn); 9. *S. Hanseni*, California (Amador, Calaveras, Alameda, and Fresno counties); 10. *S. Sartorii*, var. *Oregonensis*, "Oregon," but probably collected within the limits of what is now Washington.

**Bulletin Torrey Botanical Club*, 25: 225-133. 1898.

†*Hedwigia*, 39: 299-320. 1900.

Some of the above species are surely well founded, and it is quite as probable that some of them cover species already described. At any rate there ought to be careful study and collection of the plants of this genus in the field by fern students who reside or travel from the Rocky Mountain region westward. The remaining sixteen species recognized by Dr. Hieronymus are widely distributed in Asia, Africa, Mexico, and South America, and all were included in Mr. Baker's conception of *Selaginella rupestris*, for the Kew collection is more comprehensive than the one at Berlin.

Another line of difference of opinion is forcibly suggested by Mr. Davenport in the April BULLETIN. To a stranger, it would appear from his article that he had seen the only European *Botrychium matricariaefolium* that American eyes had rested upon, and that my own conclusions were the result of rash youthful impulse based on "mere geographical differences" alone. While I have great respect for Mr. Davenport's critical judgment, he will doubtless admit that something depends on a study of a wide range of material, and in respect to opportunities for seeing these species in field and herbarium, others have been more favored than himself.

I first met the plant in question in 1876 where a large quantity of it grew in a maple grove some five miles north of the village of Herkimer, New York, in close proximity to a similar quantity of *Botrychium lanceolatum*. Boy though I was, I saw clearly that there were two things (*i.e.* two species), for I had abundance of material at hand—the one plant just maturing, the other just past its season of spore production—and sent some specimens to Dr. Gray at Cambridge, the great "authority" then in all things botanical, and the reply came back that both were "mere forms of *B. lanceolatum*."* I knew better; even a child could have seen that they were different things; every fern student knows them to be distinct now; even Mr. Davenport, with all his conservative views, does not doubt them to be distinct species, although they are no more so than some others he does doubt. Let us hope that the world will still move when both Mr. Davenport and myself have likewise passed over to the silent majority.

Other abundant opportunities for field study were offered

*At my last visit to the Gray Herbarium in 1899 these specimens were still glued side by side on the same sheet—a silent witness to the fact that there is much sham in the "authority" idea.

later in Fenner, New York, where the plants both grow in a low cedar swamp; and at a still later period in Baldwinsville, New York, where *B. neglectum* grows in great profusion, and where I was able to study it, in the company of the veteran fern student of Central New York, Rev. W. M. Beauchamp, companion of many a delightful tramp. As to the so-called *B. matricariaefolium* of Europe (Mr. Davenport fails to notice the fact that the highest European "authorities" have abandoned this name for an earlier, shorter, and fortunately more appropriate one), I have for years been familiar with it in the herbarium, with the growing conviction that it was a different plant from ours. I have seen abundant representatives of this plant in public and private herbaria in England, Germany and France, and in 1893 I had the pleasure of seeing it growing on its native heath on Schneekopf in Thüringen, when my convictions became conclusions—the plants were surely different. It may yet be possible that *B. neglectum* Wood, is also a member of the European flora (one or two of Milde's later figures suggest this and there is other evidence); this would not be strange, for both *B. simplex* and *B. Virginianum*, once thought to be exclusively American, have been found in Europe. But that the American plant is not the ordinary European species which the "authorities" have called *B. matricariaefolium* is to me as certain as was my earlier conclusion that our plant was distinct from *B. lanceolatum*. The ordinary European plant is much more closely allied to Mr. Coville's *B. pumicola* so beautifully figured in a recent number of the *Bulletin of the Torrey Club*. Habit and structure, therefore, in addition to geography, combine to separate the American plant. Still after twenty-five years of study afield and in the best herbaria of two continents, Mr. Davenport regards me "rash," which is only a synonym of "hasty;" and without having seen the European plant in life, without having seen very much material now deposited beyond the ten-mile limit from the gilded dome of the Boston State House, he has only to send to Mr. Greenman, at Berlin, for a few specimens with which to support his previously established conclusions. Having seen the scraps of American material in so many cases besides the present one, on which European botanists have sagely based their conclusions, their right to be placed on a pedestal as "authorities" for Americans to bow down to worship has suffered in some cases a total collapse. In any case, why stop with Luerssen? Why not go

back to Milde's beautiful figures of *B. matricariæfolium*? Can it be possible that my critic has not seen them?

In conclusion it is a pleasure to note the fact that Alphonso Wood is thus tardily recognized by a New Englander as a "good botanist"—a condition strangely in contrast with the treatment he received throughout his life from his contemporaries in the same region. It gives some of the rest of us reason to hope that even in things botanical "after death comes the judgment."

Columbia University, May, 1901.

A NEW SPECIES OF ASPLENIUM.

BY B. D. GILBERT.

IN 1853 the United States Government despatched an expedition under commanders Ringgold and Rodgers to map out more accurately some of the island and continental shores of the North Pacific ocean. It was originally composed of five small vessels which kept pretty well together until the last year of the expedition, when the Hancock, a miserable, cranky vessel which the sailors called "Old John," was sent from Japan alone to take soundings and make a chart of the western coast of Kamchatka, along the Okotsk sea, where many American whalers were lost annually by reason of the imperfect maps of that coast. It will be remembered that Kamchatka is a peninsula extending south-east from the main land of eastern Siberia, and separating the Okotsk sea from Behring's sea. The Hancock sailed up the entire western coast of Kamchatka, where the botanist of the expedition made such collections as the exigencies of the voyage permitted. Our government, however, has never published the scientific results of the expedition, the only book giving any details of its work being a popular account written by Lieut. John B. Habersham, entitled "My Last Cruise." From this we learn the route that was followed, together with some details of the work done at sea, but hardly a word in regard to the collections made on land.

The fern here described was evidently collected on the western coast of Kamchatka. A second frond exactly matching it was lately found among the unnamed *Aspleniums* of the National Herbarium, by Mr. W. R. Maxon. It was collected by the same expedition and the same persons, on the island of Jezo, Japan, which lies some eight or ten degrees farther south than Kamchatka. Following is the description:

ASPLENIUM KAMCHATKANUM sp. nov. Rootstock not seen. Stipes nearly naked except for a few light colored scales at base, dull straw colored, 1 ft. long, stout angled. Rachis slender, slightly furfuraceous at nodes; lamina 12 to 20 in. long, ovate, 8 in. broad, bipinnatifid, slightly diminished in width at base, reduced suddenly at tip, which is pinnatifid and acute; mid-pinnules lanceolate, 5 to 7 in. long, 1 in. wide, ascending, lower ones 5 in. long and opposite, upper ones alternate, about 1 in. apart except the lower, which are 3 in. distant, all acuminate semi-pedunculate, pinnatifid to within a line of costa, sinus acute V-shaped, costa slightly furfuraceous; pinnules 5 to 8 lines long, 2 lines wide, *expanded at base on both sides* and adnate, never cut quite to costa, regularly 6 to 8 lobed, lobes entire and pointing forward, end of pinnules *round, blunt, entire or faintly serrate*; veins branched once or twice in each lobe; sori medial, one in each lobe forming one long row on each side of the midrib, extending not quite to the tips of the pinnules, but nearly always one in each swelling of the segments at base. Indusium tumid, straight, the free edge slightly ragged, *persistent*, dark brown.

The type specimen belongs in the United States National Herbarium, but there are two pairs of pinnæ of the same in the Eaton herbarium at Yale. The labels read: "Herbarium of the U. S. North Pacific Exploring Expedition, under Commanders Ringgold and Rodgers, 1853-56. *Asplenium filix-femina*. Bernh. C. Wright Coll. Okotsk Sea, J. Small." The fern is a pure *Asplenium*. The sorus is straight, and when mature the indusium is forced back but not covered by the sporangia, and being on one side it looks like the half indusium of a *Hemitelia*. Its affiliation seems to be with the West Indian *Asplenium conchatum*, but the sinuses are not so broad and are much sharper the pinnules are more expanded at base, the sori are larger and not so close to the midrib, and the veinlets instead of being simple are once forked.

Clayville, N. Y.

—Mr. Gilbert's statement in a recent number of this magazine that the young plants of *Botrychium obliquum* produce fruit the first year, still leaves unexplained the behavior of the sterile plants that are always found with the fruiting specimens, frequently outnumbering them. Is this another proof that the *Botrychiums* rest from spore-bearing in alternate years?

THE ROCK RELATIONS OF THE WALKING FERN

By E. J. HILL.

IN 1889 I collected *Camptosorus rhizophyllus* at St. Croix Falls, Wis. It was growing on a detached mass of trap that had fallen from a ledge by the border of a lakelet just below the village and was probably the same station from which it was obtained by Dr. C. C. Parry in 1848 when a member of Owen's Geological Survey of Iowa, Wisconsin and Minnesota. He gives as the habitat, "shaded and detached rocks, Falls of St. Croix." The kind of rock is not mentioned as in the case of some ferns found here or in other places, one of them *Woodsia obtusa*, "on trap rocks at St. Croix Falls," which was frequent in the same situations in 1889. As trap is a comprehensive term in lithology it is well to specify that the rocks of this kind at the Dalles of the St. Croix River are mostly melaphyre, or diabase porphyry.

On inspecting the list of rocks on which the Walking Fern grows, as given in the note in FERN BULLETIN for October, the question naturally arises whether there is any mineral substance common to all of them which this fern might select. A chemical analysis would be the best test if the fern is led to absorb a particular kind. The rocks mentioned are gneiss, granite, quartzite, sandstone, shale and limestone, and to them is now added trap (melaphyre). It is so wide a range that the preference of the fern would seem to be for rock rather than for any particular ingredient.

Williamson in "Ferns of Kentucky" says: "It is of easy cultivation, either in mounds or in the Wardian case," but without specifying whether on rock or ordinary soil. The rocks that have been mentioned are silicious with the exception of shale and limestone. Shale, like trap, is a generic term, and though commonly aluminous is often arenaceous, and the clays that come from their decomposition are rarely so pure as to be free from sand particles. Where I have found the walking fern on limestone, as at LeRoy, N. Y., the rocks were cherty, abounding in nodules of flint. This is true also of the limestone in the vicinity of Joliet, Ill., where the fern occurs, they being frequently cherty and often magnesian, the silicified remains of corals and other animals of the ancient seas being frequent in them. Limestone often contains clay, sand and other mineral impurities, either in pockets or mingled in their mass, as the names argillaceous, and arenaceous limestones indicate.

But silica in plant economy is not considered a nutriment. Sachs "regards it as certain that this substance is superfluous for the chemical processes of nutrition as well as for the molecular movements connected with growth."* Its office is better described as mechanical, a strengthening material which gives hardness and stiffness when deposited in the cells of their tissues, or still better a hindrance to excessive transpiration when left in the cortical cells or epidermis. This check on evaporation is a great benefit to plants growing on rocks like many of the ferns, where the supply of water is scanty.

If we take account of the mineral ingredients which are directly nutritious of plants, such as lime, potash, soda, magnesia, iron, the rocks mentioned, either in their pure or impure condition, contain most of these in some measure. They enter into the silicates which are variously combined and make up the mass of granite, granitoid, syenitic and volcanic rocks, from whose decomposition come the common mineral foods the soil supplies to plants.

That ferns as well as other plants like a particular mineral food is well known. Sadebeck showed this experimentally. He took specimens of *Asplenium Serpentinum* and *A. adulterinum*, which have a preference for serpentine or silicate of magnesia, and cultivated them in soil that did not contain a trace of serpentine. By the sixth generation they had lost their identity and were changed to two other spleenworts, *A. adiantum-nigrum* and *A. viride*. Warming, from whose Manual of Ecological Plant-Geography these facts are taken, uses them to show that soils may be decisive factors in originating species. In this case the characters of the two ferns had not become permanently fixed. They were evidently derived from the two into which they were changed, since time enough had not elapsed for the serpentine rocks to gain such a mastery over their denizens that they would not return when placed under less favorable conditions to maintain their peculiarities.

Chicago, Ill.

* Physiology of Plants, p. 2887.

—According to a writer in the May number of *Meehan's Monthly* the Indians of Nevada use the outer layers of the Bracken's root-stock in basket making, its dark color serving well for making various figures in the pattern.

HELPS FOR THE BEGINNER.*

V.—THE QUILLWORTS.

FROM now until autumn closes the collecting season, the student of the fern allies should be on the lookout for quillworts (*Isoetes*.) All who have ever dabbled in the study of the higher cryptogams have some sort of a hazy idea of what a quillwort is like, but comparatively few have ever collected them or would know exactly what to look for if desirous of finding



Isoetes echinospora var. *Braunii*.

About natural size.

them. They are such inconspicuous little plants and mimic so well the small rushes and other water plants among which they grow, that many a collector feels confident that they do not exist in his locality, though it is quite likely they are to be found by careful search. If after several years collecting

he suddenly stumbles upon them, he half believes that they, too, "possess the recipe for fern seed" and "walk invisible" when they choose.

Even if they do not possess supernatural powers there is still much that is mysterious about them. Their distribution is a puzzle. In some sections, as in the New England States, every pool seems liable to the charge of harboring a different species; while in other parts, although the mud is as soft and the sand as clear, not a species has yet been reported. Then the question arises, are the plants really absent or merely overlooked, but it cannot be answered until collectors have made a more diligent search for them.

A quillwort may be described as a rosette of slender, pointed leaves from two to six inches long, growing under water. Other water plants also have their submerged leaves in rosettes, but the quillworts are easily distinguished from all others by the fact that each leaf is hollowed out at base on the inner side and bears in the hollow an oblong mass of spores. Those in the outer circles of

* Begun in July, 1900. This series will include all the American ferns.

leaves are the largest and are called the macrospores; those nearer the centre are smaller and called microspores. These spore masses make the base of the plant very thick and bulb-like. There is no perceptible stem and the plant always remains a tuft of leaves. Its identification, however, is always certain because of its method of bearing spores.

The majority of the quillworts grow in water, but there a few species that live on dry land. In appearance, all are alike. One of the commonest of the submerged forms is *Isoetes echinospora*, whose varieties are found nearly around the world in the northern hemisphere. They grow on the bottom of lakes and ponds in from one to several feet of water and are likely to be passed unseen unless one happens to be looking down into the water as his boat glides over their dwelling places. In the bottom of some of our glacial lakes they grow almost as thickly as grass does on the banks, forming fresh and verdant sub-aqueous meadows over which the dull-eyed fishes graze. He who has seen *Isoetes* only when pressed and dried and glued to an herbarium sheet, will scarcely recognize the living plant. In life the leaves spread in all directions, only the central ones erect.

Another widely distributed species, the type of the amphibious kinds is *Isoetes Engelmanni*. It is most common on gravelly river shores. My own locality for it is at least forty miles long, barring a few interruptions in the way of cities and towns that cluster on the banks of the river along which it grows. Early in the year when the streams are full, it is likely to be entirely submerged, but about mid-summer the receding current leaves it uncovered. It is a tall species with leaves six inches or more long. In the water they sway with the current, but on land they are too weak to remain erect, and fall over on all sides, reminding one of a tiny green fountain.

While it is easy enough to distinguish the quillworts from other plants, it requires a compound microscope, time and patience to be sure of the species. With practice it is no more difficult to name these plants than any others. If after trying to identify them one is not quite sure, he had better send his specimens to a specialist like Mr. Eaton or Mr. Dodge—they might be new species!—*W. N. C.*

—Prof. C. E. Waters writes that 1894 he found along the Gunpowder river near Baltimore, specimens of what prove to be the recently described *Asplenium ebeneum* f. *Hortonæ*.

NOTES ON AMERICAN FERNS: IV *

BY WILLIAM R. MAXON.

THE HART'S-TONGUE IN TENNESSEE. At the New York Meeting of last summer I presented a paper "On the Occurrence of the Hart's-tongue in America."† Two localities for the fern in Tennessee were described, neither one of which I had at that time seen. In the following August, however, a collecting trip in the South afforded me an opportunity of visiting both. I have since described ‡ somewhat more fully the South Pittsburg station; the present note is merely to call attention to the supposed absence of the fern at Post Oak Springs, the other locality from which it had been reported.

Post Oak Springs is but two or three miles from the railway station of Cardiff, some 75 miles north of Chattanooga. With the aid of a guide I was able to locate the two caves mentioned by Dr. Gattinger; but a half day's careful exploration in the vicinity of the "dry cave" proved fruitless so far as *Phyllitis* is concerned; *Asplenium parvulum*, *A. ruta-muraria*, *A. angustifolium*, *Pellaea atropurpurea* and *Camptosorus rhizophyllus* were common. The situation naturally is altogether favorable to the Hart's-tongue; but the wonderfully cool draughts issuing from the cave, the picturesque scenery and the delightful shaded slopes render the vicinity an ideal picnic-ground, and it is small wonder that any particular species of plant should disappear, especially if of an unusual type, as the Hart's-tongue is. Dr. Gattinger now writes that he observed the plant only on one occasion; but as the species is one with which he was familiar in Germany there is no reason for doubting the record of its former occurrence at Post Oak Springs. Either forest fires or cattle may have been responsible for the havoc I have charged to the picnicker. Dr. Gattinger is inclined to regard fires as the most potent factor in extermination, and he writes that he once fought a fire on this very "Cave Spring" farm. The plant *may* have persisted here through various vicissitudes to the present, but if this be the case better eyes than the subscriber's are needed to find it!

POLYPODIUM FALCATUM A WESTERN "TREE FERN." Exception

* Published by permission of the Secretary of the Smithsonian Institution.

† Since published in Fernwort Papers, pp. 30-46. 1900.

‡ Plant World, 4: 129-132. 1900.

must be taken to the statement of Mr. Parish in the last number of the FERN BULLETIN (p. 40) that *Polypodium scouleri* alone of the Pacific coast ferns grows upon the "mossy trunks of trees." Mounted on a sheet with specimens of *P. falcatum* I find in the D. C. Eaton herbarium the following note addressed to Professor Eaton, under date of January 2, 1885, by Miss Jennie R. Bush of San Jose, California:

"With this I take the liberty of sending to you a species of fern gathered by the school children from the trees near the school house at Garberville, Humboldt County, Cal. I suppose you may have the same. The interesting point to me was the fact of its edibility when roasted. The children call it "licorice." Raw it tastes much like the "ground-nut," but sweeter; when roasted, it (the "roots" of course) tastes like a very sweet fine-grained sweet potato. It grows in the moss on oaks, madrones, and other moss-covered trees—not in the "gray moss"—and adds a remarkable graceful beauty to the forests along the river in that part of Humboldt County."

In the same herbarium is another sheet of specimens collected by A. V. Kautz in 1855 at Port Orford, Oregon, with the following note: "Grows upon maple trees most abundantly, but sometimes is found on the cedar, fir and other trees. Roots used as an emolient and expectorant; taste resembles licorice." Several other sheets in the Eaton and National Herbaria give the habitat as "on trees," thus substantiating the two very specific statements here recorded. "Licorice fern" is given by Lawson* as a common name for this species, but the licorice-like taste is characteristic of most, is not all, of the western polypodies. Indeed, the rootstock of *P. hesperium* is so intensely sweet as to be almost nauseating.

SCIENTIFIC NAME OF THE SILVERY SPLEENWORT. The following is a correction of the synonymy for this species as given in my recent paper in Volume XXIII of the Proceedings of the U. S. National Museum: *Athyrium acrostichoides* (Sw.) Maxon, comb. nov.—*Asplenium acrostichoides* Sw. Schrad. Journ. Bot. 1800²: 54. 1801.—*Asplenium thelypteroides* Michx. Fl. Bor. Am. 2: 265. 1803.—*Athyrium thelypteroides* Desv. Mém. Linn. Soc. Paris 6: 266. 1827.

Swartz's original description is seemingly inadequate, and if his specific name were to rest on this alone we would hardly be

* Fern Fl. Canada [25]. 1889.

justified in accepting it in place of Michaux's *thelypteroides*, published two years later. Swartz, however, in his *Synopsis Filicum* (1806), after repeating his early diagnosis (p. 82) publishes a fuller description (p. 275) and assigns a definite locality to the fern. The longer description points definitely to our plant of eastern North America, and it seems but just to interpret his early characterization in the light of his amended description, even though Michaux's name had been published in the interim. There is of course the alternative of holding to Michaux's as the first recognizable diagnosis, in which event *Athyrium thelypteroides* (Michx.) Desv. should be taken up. The fact that in 1836 the name *Athyrium acrostichoideum* Bory was published, applied to a wholly different plant, does not, according to current practice, militate against the transference of Swartz's specific name to the genus *Athyrium*.

THE GENUS *EQUISETUM* WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON.

EIGHTH PAPER.

E. PALUSTRE L.

RHIZOME 7 angled, shining brown or black, without felt or tubercles $1\frac{1}{2}$ "-6" thick, solid at center, but with large vallicular cavities separated by dissepiments only two cells thick. Fertile and sterile stems alike, save that the former is terminated by a fruit-spike about 1' long, raised on a short pedicel. They are prominently 5-10 angled, usually naked and nearly smooth below, branched and rough above, with distinct irregular cross bands of silica traversing the ridges and grooves; ridges narrow, sharply elevated but rounded on the back, $\frac{1}{3}$ as broad as the deep grooves; stomata abundant, usually broadly oval, disposed in a broad irregular band of 10 to 12 rows; sheaths gradually widening upward, green or variously marked with brown or black, leaflets convex, keeled below the middle with a distinct carinal groove which extends into the teeth. Teeth broadly lanceolate, sharply pointed, usually black, with a broad white hyaline border. Branches 4-7 angled, rough with abundant cross bands of silica; teeth and sheaths similar to those of the stem, but the latter usually green, the former deltoid or narrowly lanceolate, with a carinal groove. A section of the stem shows all three kinds of

openings, the central occupying about $\frac{1}{6}$ the total diameter; there is also a row of yellow cells separating the carinal from the vallecular cavities. Fruiting most abundantly in June, but may be found after that sparingly through the summer.

HABITAT.

As the name indicates, this species thrives in swampy places. It grows best in damp meadows amongst grass, but also in deep swamps, in sour soil, in sandy places with damp subsoil; also in damp woods with *E. arvense*, from which Milde says it is often hard to distinguish, even by an expert. Usually densely gregarious, it becomes scattered in grassy places and amongst bushes, where it often climbs by means of excessively elongated branches.

The American plant usually has a different aspect from the European, the sheaths and teeth of the branches are longer, the latter more acute, the roughness of the branches is less disposed in cross-bands, and various other minor differences might be noted, but hardly enough to justify its erection into a geographical variety, at least until the differences are found to be constant.

Abundant in Europe from the farthest north to $44^{\circ} 50'$; rarely found in America. It has been seen by me from the following places: Maine—VanBuren, *Fernald*; New Hampshire—Manchester, *F. W. Batchelder*; Vermont—Burlington Bay, *Grout*, *Eggleston*; near Sorel river—*Pringle*; Connecticut—Selden's Cove, Lyme, under influence of tides—*C. B. Graves*; New York—Buffalo, *Clinton*; Illinois—Peoria, *Brendel*; Washington—Columbia river, *Suksdorf*; Tacoma, *Flett*; British Columbia—New Westminster, *Hill*; Alaska—Popoff I., *D. A. Saunders*; Arakamtchetchene I.—Behring Straits, *Wright*; Alberta—Banff, *Macoun*; Ontario—Lake Nipigon, *Macoun*; Saskatchewan—Red Deer river, *Macoun*. Found also in Newfoundland and about Hudson's Bay. Minnesota localities need verification. Has been reported from Arizona, but probably a variety of *laxigatum* has been taken for it, as the branches have a very similar appearance under the lens.

The Indians of Alaska make baskets of the rootstocks of an *Equisetum*. In the absence of the aerial portion it is impossible to diagnose these with certainty, but there is little doubt that this is the species employed, although specimens submitted to me were of the unprecedented thickness of one's finger.

This species has no near relatives. In the structure of the stem, especially in section, it greatly resembles *Arvense*; but as

its fertile stems are like the sterile, it must be considered as more closely related to *litorale* and *fluviatile*. It is somewhat nearer *E. bogotense* of South America and *diffusum* of Central Asia, but is sufficiently distinct to be classed as unique.

VARIETIES.

The following forms have been found in this country:

1. *Tenue* Doell. Stem 6-8 angled, 2'-8' high, erect, naked, or with a few, mostly basal branches. Seen only from Alaska, as quoted above. Appears to be reduced from its boreal habitat.

2. *Fallax* Milde. Stem stout, erect, 10-12 angled, with regular verticils of branches 3'-6' long; lowermost sheaths of branches (ochreolæ) black with brown border. In America this includes all the specimens seen from Washington and British Columbia. First collected by Dr. Lyell in 1859. The European plant has been described as a hybrid between *palustre* and *Telmateia*, but no characters of the latter except size are discernable.

3. *Ramulosum* Milde. Stems weak, often climbing among bushes, 1½-3 ft. high, 8-10 angled, with several verticils of very long (8'-14') weak branches. Appearance similar to some forms of *arvense*, with which it grows; most closely resembling *litorale* var. *elatius*. I have seen this only from Manchester, N. H., sent me late in the season by F. W. Batchelder. Possibly it is the late season form of the species: but it is strikingly different from any other form I have seen, especially from var. *fallax*, the branches of which are strongly bowed, stout and twiggy, while these are quite slender, strictly erect, and so strongly resemble *arvense* that specimens of that were included in my material.

4. *Polystachyum* Vill. Stem and branches of the upper verticils tipped by a normal spike. Very common in Europe, but seen only once in America. Coll. by Eggleston and Jones at Appletree Point, Burlington, Vt.

[In October, *E. litorale* will be discussed, at which time sets of specimens illustrating both *palustre* and *litorale* will be distributed. Correspondence relating to the sets should be addressed to Mr. Eaton at Seabrook, N. H.]

—A subscriber commenting on the size of the Christmas fern, says that the commonly accepted maximum height of two feet does not cover the most luxuriant plants. In this she is quite correct. Almost any piece of rocky woodland will show larger fronds. On the talus at the base of the Palisades along the lower Hudson, the editor has seen many magnificent plants with fronds fully a yard long, and doubtless even longer fronds could be found by searching. Botanizing there, however, has its drawbacks, as the loose stony banks are the dwelling places of numerous venomous snakes.

A NEW FORM OF CYSTOPTERIS.

BY WILLARD N. CLUTE.

IT is remarkable that some species of ferns produce varieties and forms with fairly constant characteristics, while other species, though quite as variable, never produce plants sufficiently distinct in appearance to be regarded as worth naming. The little *Cystopteris fragilis* barely escapes being placed in the latter



Fig. 1.

class. It has produced some few variations that have been considered worthy of name, but none that will compare in individual characters with such forms as *Polystichum acrostichoides* f. *incisum* or *Nephrodium cristatum Clintonianum*. It was therefore with considerable interest that I examined certain specimens collected last year along a rocky wall where the Susquehanna river makes a "great bend" from the north into the State of Pennsylvania. These plants scarcely differ from other forms of *Cystopteris fragilis* in the cutting of the fronds, but the sori present a most remarkable difference. They are more than twice the size of the sori in ordinary specimens and so thickly crowded together that very little of the under surface of the frond can be seen. All collectors



Fig. 2.

will recall the small size and evanescent nature of the sori in this species. The indusium soon withers and the sorus, which frequently consists of only a few spore-cases, is early dispersed or broken up. In the new form, on the contrary, the sori in addition to being unusually large retain their hemispherical form long after the spores are ripened, and are so compact and distinct that if any fern collector was offered a single sorus to identify, he would be likely to pronounce it that of *Polypodium vulgare*, at once.

Considering the important part played by the sori in the determination of species, some students might think me warranted in describing this as a sub-species at least. It is as well entitled to such distinction as many recently described, but from investi-

gations which I have been carrying on for some time, I am convinced that this is only a form due to the exposed habitat it affects. This is the first instance, I believe, in which the effect of habitat is shown in a difference in the size of the sori. Any shade-loving

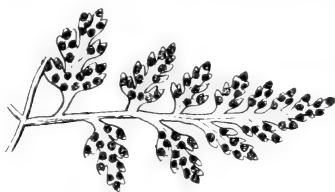


Fig. 3.—*Cystopteris fragilis*
forma *magnasora*.

fern exposed to direct sunlight tends to become pale in color, thicker in texture and more fruitful, the latter characteristic being manifested in the number of the sori rather than in their size.

I find in my herbarium a sheet of this form collected by Mr. Maxon near Oneida, N. Y., and Mr. Gilbert writes me that he has specimens to match mine from Glens Falls, N. Y. The plant is a dry rock form and doubtless will be reported from other places. At present it is known only from New York State. I would characterize it as follows :

CYSTOPTERIS FRAGILIS forma *MAGNASORA* forma nov. Frond 6 to 12 inches long; stipe as long as the blade, the latter 2-3 inches wide, twice pinnate with lobed or toothed pinnæ. Primary pinnæ broadest at base, triangular. The superior basal pinnæ much the largest. Secondary pinnæ triangular or oblong. Sori round, distinct, abundant, 2 to 2½ times larger than those of the species, Collected Aug. 10, 1900, at Great Bend, Pa. Type in the author's herbarium.

In making the illustrations for this article, great pains have been taken to exactly duplicate representative pinnæ. Fig. 1 is from a common form that approaches *f. magnasora* in shape. Fig. 3 is a basal pinna of the new form. Fig. 2 is a pinna from a plant collected by the writer in Jamaica. All are natural size. Since some will incline to remove this to *Filix* it may be well to add that it would then become *Filix fragilis magnasora*.

—The May number of the *Botanical Gazette* contains an article by C. T. Druery on "Fern Variation in Great Britain," in which the statement is made that 1859 varieties of British ferns are known. The Hart's-tongue is credited with no less than 450 varieties!

BENJAMIN DAVIS GILBERT.

THE student of American ferns does not need to be informed that Mr. B. D. Gilbert whose portrait appears in this issue, is one of the most prominent of our amateur fern students. For a long time the study of ferns has been his avocation, though he has pursued it as energetically as if it were his vocation. Mr. Gilbert was born at Albany, N. Y., Nov. 21, 1835, and graduated at Hamilton College in the class of 1857. His attention was first turned to botany shortly after leaving college, when being in poor health he took up this study as an incentive to frequent rambles in the fields and woods. This resulted in his contributing many valuable notes to Paine's "Plants of Oneida County and Vicinity." In 1860 Mr. Gilbert engaged in the book business at Utica, N. Y., and sixteen years later joined the editorial staff of the *Utica Morning Herald*, upon which he served until 1889. During this time—more than a quarter of a century—botany was practically laid aside, but after leaving the paper it was taken up once more, and ferns made a specialty. Since then Mr. Gilbert has travelled extensively, partly for his health, but always with an eye to the ferns. In 1893 he was in the Lesser Antilles, Martinique and St. Thomas; in 1894 in Southern California; in 1895 in Jamaica, where nearly two-thirds of the species in that rich fern flora was collected, and in 1898 the winter was spent in Bermuda. During this time he has been untiring in buying, exchanging and collecting ferns and his herbarium now numbers upward of 3,000 sheets representing nearly 1,500 species.

Mr. Gilbert is a member of the Torrey Botanical Club, of the Society of Colonial Wars, and Vice-President of the Fern Chapter. He has contributed many articles to the scientific press, one of the most noteworthy being "A Revision of the Bermuda Ferns." He has also a broad knowledge of the Dairy industry, having been secretary and treasurer of the Utica Dairy Board of Trade since 1878, and secretary of the State Dairyman's Association for several years. He is also author of a pamphlet on the cheese-making industry in New York, published by the United States Government.

--Dr. William Trelease has recently described a crested form of *Pellaea atropurpurea* found in Missouri. The form is like typical plants, except that the tips of the pinnules are crested. It is called *P. a. forma cristata*.

A LIST OF THE FERNWORTS COLLECTED IN JAMAICA.*

BY WILLARD N. CLUTE.

(Continued.)

LONCHITIS L.

81. *L. aurita* L. One of the rarest of Jamaican ferns. Gathered by Nock in 1880 and not since seen until collected by William Harris, Esq., in 1898. In the damp forest in sphagnum beyond New Haven Gap. (103).

LOMARIA Willd.

82. *L. attenuata* Willd. A curious fern with long slender erect trunk supported by clinging to trees. Fronds in circular tufts at top. Common in mountain forests. Morce's Gap. (81).
83. *L. procera* Spreng. Common on wayside banks. Cinchona. (71).

BLECHNUM L.

84. *B. occidentale* L. One of the most abundant of ferns, found from sea-level to the tops of the mountains, often completely covering wayside banks. (41). The variety *minor* Hook. was collected at Cinchona.

ASPLENIUM L.

85. *A. serratum* L. In crotches of trees spreading in broad vase form and resembling the *Bromelias* with which it dwells. Above Moore Town. (148).
86. *A. pumilum* Sw. On dry banks, tolerably common. Gordon Town. Quite insipuous. Grows with *Gymnogramma rufa* and *Hemionitis palmata*, both of which it resembles in the texture of frond. (330).
87. *A. parvulum* Mart. & Gale. Common on rocks and in the chinks of stone walls. This seems to have been mistaken for both *A. trichomanes* and *A. ebenum* by collectors in Jamaica.
88. *A. monanthemum* L. Latimer River, not common. This fern has the habit of producing new plants on the rachises after the pinnules have fallen. (145).
89. *A. formosum* Willd. On wet rocks above Moore Town. Not common. (279).

* Began in July, 1900.

(To be continued)

EDITORIAL.

A LOOK AHEAD

When the FERN BULLETIN enters its tenth volume which will be next January, it is planned to increase its size by the addition of eight more pages. This is rendered necessary by the unprecedented activity among fern students. For lack of space we have constantly to hold matter that should be published. Eight more pages will make room for a large number of these timely articles. With this increase in size we shall raise the subscription price to 75 cents a year. Our original purpose was to make the increase in size without an increase in price, but the cost of all the materials used by the printer has recently risen so much that this is impossible. We shall therefore try the experiment of raising the subscription price, for one year at least, beginning October 1st. This advance need trouble none of our present subscribers, however, for we shall continue to receive renewals and subscriptions at the 50 cent rate for any number of years in advance until the October number is issued. Several important features will be added to the new volume and it is hoped that all our present subscribers will order it.

.
*

NO STABILITY

That is a significant paragraph of Prof. Underwood's book in which he says: "The question of the proper use of botanical names is by no means a simple one. The botanical literature of the world must be ransacked before stability can be reached. An obscure local publication in the Italian language, on the plants of Sicily, in this case furnishes the generic name for a plant which grows in the Northeastern States." (This refers to the proposal to substitute *Metteuccia* of Todaro for *Struthiopteris*). When botanists realize the full import of this statement, many will, no doubt, cease chasing will-o'-the-wisps and return to the solid ground of conservative nomenclature. The stability to be gained by absolute priority, proves to be instability itself. If we are not to have stability until all the obscure local botanical publications in the world are ransacked, the case is indeed hopeless. No matter how painstaking a student may be—no matter how carefully he has gone hunting in the shades of obscurity for buried fern names—the day after his work is published, another botanist who took a different path through these same shades

may return with another dead name, galvanize it into life and therewith undo the work of his predecessor. And so the merry Science of Nomenclature goes on. We can never be sure that the last change has been made in the name of any genus. From their very obscurity and general worthlessness, most of the pamphlets like Todaro's have been consigned to oblivion; but who will assure us that after we have settled down to "stable nomenclature," some inquisitive student, delving in the wastebasket of time, may not get hold of another pamphlet and treat us to an earthquake. We need stability more than we need priority and the two seem incompatible by present methods. For the ordinary student of ferns who would be understood, there seems no way out of the dilemma except to stick to the names used in all but the very latest botanical text books; to establish a priority of those names who got there first and stayed, and not allow them to be ousted by new comers, even if they can prove their claims to hoary antiquity. It is not which name ought to prevail, but which one did, that should concern us.

BOOK NEWS.

The fourth fascicle of Howell's "Flora of Northwest America" was issued March 21, 1901. It covers the families between the Compositæ and Boraginaceæ, following essentially the arrangement of Gray's Manual.

Prof. Peck's recent publications upon the edible mushrooms of New York State have been in such demand that he has reissued them in the form of a memoir, which is essentially the second volume of his descriptions and illustrations of the edible and poisonous fungi of New York. The present volume is entitled "Memoirs of the New York State Museum, Vol 3 No. 4," and bear date of Nov., 1900.

The fact that Mrs. Mabel Osgood Wright has the faculty of treating all out-door subjects in a fresh and original vein is again made plain by the appearance of "Flowers and Ferns in their Haunts"† The book is a chronicle of the author's impressions during a summer's ramblings through field and wood in Connecticut, in which the flowers come in for the greatest share of atten-

† Flowers and Ferns in their Haunts, by Mable Osgood Wright. New York: The Macmillan Co. 1901. 8vo. pp. 258.

tion, though birds and other wild creatures are not overlooked. In this day of almost a surfeit of books on Nature, the present volume is welcome by reason of its superior merit. The author is sometimes woefully astray in her botany, to be sure, but this is doubtless to be set down to her too implicit reliance upon common names. In Ornithology, where Mrs. Wright is best known, the birds have common names that are fairly constant, but this state of affairs does not exist in the allied province of botany. There is a list of the flowers mentioned with their scientific equivalents at the end of the book, but it would have been much easier for the reader if these had been added where the common names occur in the text. A large number of the illustrations are from photographs—and photographs of an excellence rarely equaled in books of similar character. The illustrations from drawings are good, but by no means the equals of the others. The Fern part of the title is based upon a single chapter.

Those who buy "Nature Studies in Berkshire"† in the expectation of getting long treatises upon birds, bugs, flowers and such like subjects, will be disappointed, but it will be an agreeable disappointment. The birds and flowers are there, but they stand for something more than material from which to make lists of species. Before the reader has gone a dozen pages into the book he sees that here is one who not only loves nature and sees her from a unique and individual standpoint, but is able to set down his thoughts in entertaining form. The author is a contemplative naturalist, wholly devoid of a desire to "collect" unless it be a nosegay for a friend or a bouquet for the house, and his work frequently reminds one of an earlier New England writer, Wilson Flagg, whose books on similar subjects are still worth reading. "Nature Studies" was first issued nearly two years ago, but the popular edition has just appeared. It can be recommended to all as an example of virile and expressive English, as well as an interesting volume on the natural history of western Massachusetts. The book is well printed and is illustrated with sixteen plates from photographs.

The Editor's book, "Our Ferns in their Haunts," which was issued early last month from the press of the F. A. Stokes Co., is an attempt to provide information about our ferns that cannot be gleaned from the ordinary text-book. In compiling the data re-

† *Nature Studies in Berkshire*, by John Coleman Adams. New York: G. P. Putnam's Sons. 1901. 4to. pp. 225.

garding the uses, folk-lore and common names of the ferns, every available book and publication was searched. The descriptions of species, however, were not taken from books, but drawn from the specimens themselves. Special trips were made to distant localities in order that the haunts of each species might be accurately described. In the case of rare species, especial pains have been taken to give full details about them, in order that others may be helped in looking for them. There is an illustrated key to the genera—the first ever published—and also a check-list of all the species, besides an extensive glossary. The illustrations are more than 200 in number and several of them are colored. They are the work of W. W. Stilson, and it is no exaggeration to say that none better have ever appeared in any fern book. Every species is illustrated and in many cases several different illustrations of the same species are given.

In the six years that have elapsed since the publication of the Fern Chapter's list of North American Ferns, most of our species have become better known and our ideas regarding their range and abundance have been modified accordingly. Many new species have also been described and for some time the need of a new list has been apparent. In issuing his "List of the Ferns"|| Mr. Maxon has supplied this lack and rendered students a valuable service. The care he has taken to exclude all plants wrongly identified, and his endeavors to verify all doubtful references in preceding works, has given us an excellent list and one whose data we feel can be relied upon. If he has erred at all in the matter of range, it is upon the conservative side—as in limiting *Pteris caudata* to southern Florida, when it is known to grow in several of the other Gulf States as well. Another important and valuable feature of this list is the full synonymy given, together with the date and place of publication of each name. This is something for which fern students have often wished. In view of the general excellence of other parts of the work, it is to be regretted that the nomenclature used is out of all relation to the customary usages of fern study. Take for instance *Asplenium dentatum* L. which the author would have us call *A. trichomanes-dentatum*. In this case it is almost certain that had Linnaeus been acquainted

|| A List of the Ferns and Fern Allies of North America, North of Mexico, by William R. Maxon. From Proc. U. S. Nat. Mus., Vol. XXIII, pp. 618-651. Washington: May 4, 1901.

with the modern way of writing species, he would have inserted a *var.* instead of a hyphen between those two words and when it was found not to be a variety of *A. trichomanes* would have called it *A. dentatum*, as it should now be called. Botanists are too far committed to a binomial nomenclature to make three words desirable as the name of a single species. It is also difficult to understand by what rule Mr. Maxon makes *Tectaria trifoliata* (1802) do duty for *Aspidium trifoliatum* (1801). This is scarcely priority, for *Aspidium* is generally understood to be based upon this very species. There are several changes of similar nature, especially *Dryopteris oreopteris* for *D. montana*, but we have not space to discuss them all. In many cases these changes are based upon reasons so nearly like guess-work as to prevent most botanists from following them. It may be stated without much fear of disapproval that some of these changes were originally made upon matters of opinion as to which of two early publications was first. In the matter of species, varieties and forms the author's work is also rather uneven. Notwithstanding its defects in nomenclature the list as a whole is a very good piece of work.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—One of our most untiring members is Mr. J. H. Feriss, who has charge of the ferns in the public park at Joliet, Ill. He has nearly one hundred of our native species under cultivation.

—Twelve new members were admitted to the Chapter in the first half of this year. Their names and addresses will be found in the Annual Report just issued.

—The Chapter has recently lost two members by death. These are Anthony Baumann of Scranton, Pa., and D. B. Osler, Toronto, Canada. A more extended notice will be published in the next Annual Report.

—Prof. C. E. Waters, 13th st. and Walbrook avenue, Baltimore, is working over his key to the ferns with reference to the stipes with the intention of publishing it and desires living fronds and entire stipes of Nos. 6, 32, 67, 88, 89, 92, 96, 101, 102, 114, 127, 136, 140, 147, 151, 157, 158, 173, 177, 179, 180, 182 and offers to exchange other ferns for them. Here is a chance for our members.

50 cts. per Year
15 cts. per Copy.

Vol. IX.

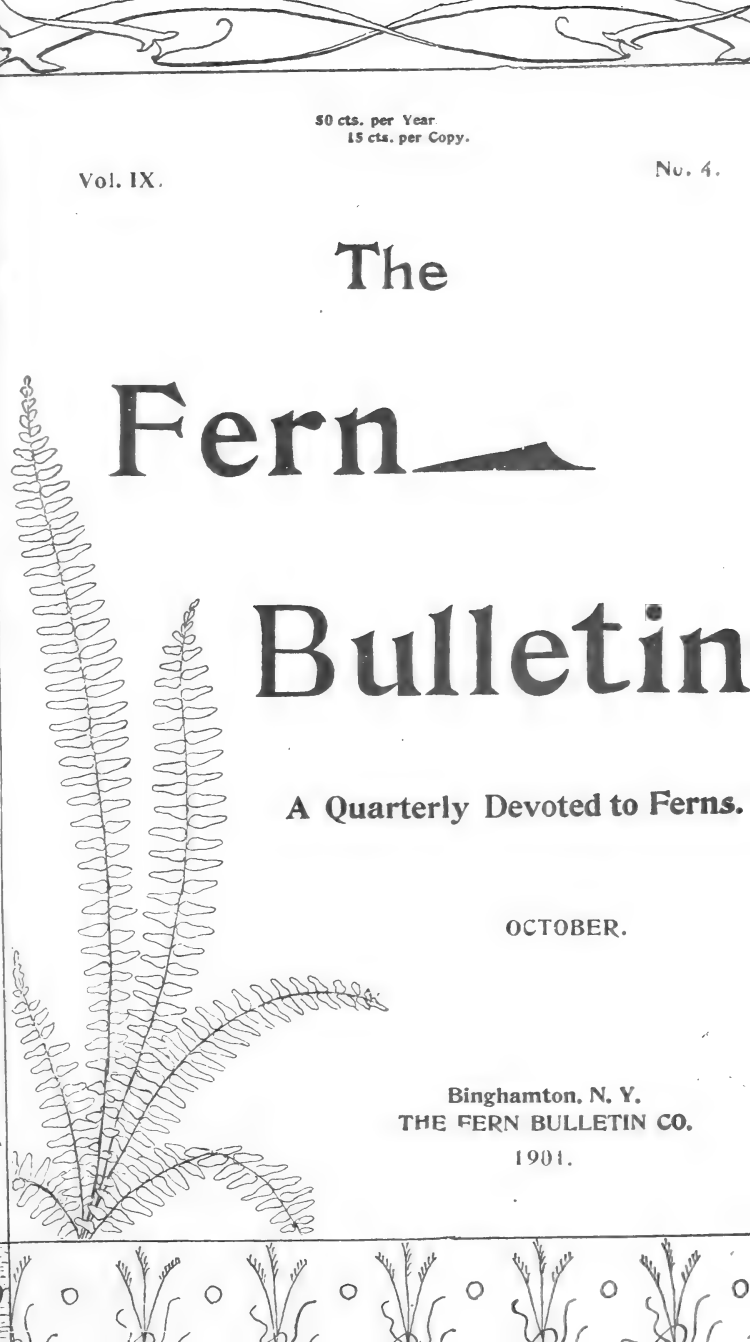
No. 4.

The Fern Bulletin

A Quarterly Devoted to Ferns.

OCTOBER.

Binghamton, N. Y.
THE FERN BULLETIN CO.
1901.



—THE—
FERN BULLETIN.

A QUARTERLY DEVOTED TO FERNS.

WILLARD N. CLUTE, Editor.

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

20 CENTS A COPY ; 75 CENTS A YEAR.

Awarded Grand Prize at the Paris Exposition.

To insure subscribers against loss of one or more numbers between the expiration and renewal of their subscriptions the journal will be sent until ordered stopped. All arrearages must be paid.

Personal checks must contain ten cents extra for collection. Otherwise credit will be given for the amount less collection fees.

Entered at the postoffice, Binghamton, N. Y., as second-class mail matter.

THE LINNAEAN FERN CHAPTER.

PRESIDENT, WM. R. MAXON, U. S. National Museum, Washington, D. C.

SECRETARY, MISS MARGARET SLOSSON, Andover, Mass.

Fern students are cordially invited to join the Chapter. Address either the President or Secretary for further information.

THE • AMERICAN • BOTANIST

WILL BE ISSUED ON THE 15TH OF EVERY MONTH
BEGINNING IN JULY.

It will be absolutely untechnical and edited solely for the flower-lover. There is no other journal like it. Be sure to get the first number. Sample copy for a two-cent stamp. If you are interested in Botany and not nomenclature, try this journal.

Willard N. Clute & Co., Publishers, Binghamton, N.Y.

WANTS AND EXCHANGES

Special announcements inserted here for One Cent a word. No notice received for less than 25c. No charge for address.

WANTED—Back Nos. of THE FERN BULLETIN to complete files as follows: Vol. I-III, Nos. 2-7, 11, 12; Vol. IV, No. 1; Vol. V, No. 1. O. B. Douglas, M. D., Suncook, N. H.

WANTED—To complete files, Nos. 2-7, 11 and 12 of Vol. I-III, and No. 1, Vol. IV, *Linnaean Fern Bulletin*, and Nos. 1 and 3 of Vol. V, FERN BULLETIN. Any reasonable price paid. O. M. Olson, Fort Dodge, Iowa.

WANTED—*Linnaean Fern Bulletin*, Nos. 2, 3, 11 and 12 of Vol. I-III. A good price will be paid. E. A. Noyes, 12 Essex St., Newburyport, Mass.

WANTED—Specimens of any *starred* species or variety in my recent List of North American Pteridophytes. Am willing to purchase or make exchange. Correspondence desired. B. D. Gilbert, Clayville, N. Y.



THOMAS MEEHAN

THE FERN BULLETIN

VOL. IX.

OCTOBER, 1901.

NO. 4.

CALIFORNIA FERN GOSSIP.

BY S. B. PARISH.

“**E**QUISETUM RAMOSISSIMUM.”—One is somewhat presumptuous to doubt the correctness of the identification of a plant, when he has never seen the specimen; and this note may expose me to such an accusation, especially as it disturbs what appears to be the last lingering hold of this African scouring rush on a place in the American Flora. Nevertheless, I will venture the opinion that Dr. Davidson's Los Angeles specimens, which, in Mr. Maxon's recent list, Mr. Eaton has referred to this species, will be found to be really one of the forms of that very variable plant which we are calling *E. Mexicanum* Milde. What may prove to be the correct name of this I have no idea, and await with interest the time when Mr. Eaton shall reach it and tell us.

CALIFORNIA FERNS WHICH GROW ON TREES.—Mr. Maxon very properly calls attention in a recent FERN BULLETIN to my slip in asserting that *Polypodium scouleri* was the only California fern which grew on trees. I should have remembered that this habit in *P. falcatum*, of which he gives instances, had been noted by all who have written of our western ferns. Dr. D. C. Eaton notices it in Brewer & Watson, Bot. Cal. 2: 334 (1880); Mr. Lemon in his Pacific Coast Ferns, 6 (1882); and Mr. Jones in Ferns of the West, 12 (1882). In both *P. scouleri* and *P. falcatum* the tree habitat appears to be more common than growth in soil or among rocks. But it will be observed that this habit confines both ferns to the moist and temperate redwood belt. Dr. Eaton tells us that in the same region *P. vulgare* also grows on tree trunks. But such a habit is inconsistent with the conditions which prevail in the more arid parts of the State. If any one has seen a tree-inhabiting fern outside of the redwood belt, the fact would be worth making known.

CHEILANTHES FIBRILLOSA AND C. PARISHII.—It is now some twenty years since the type specimens of these two species were

gathered; their validity has not been doubted by any subsequent student of ferns, but they remain known only from the original collections. To facilitate their rediscovery it appears desirable to place on record the exact places at which the types were found. Both were discovered at the base of San Jacinto Mountain, but on opposite sides of it, in what was formerly San Diego, but is now Riverside county. *Cheilanthes Parishii* came from the eastern, or desert, base of that mountain. Here, under its shelter, an arm of the desert pushes in, and is watered by three streams which drain its acclivities. A hot sulphur spring rises in the plain, which gave the place its Spanish name of Agua Caliente. Twenty years ago it was occupied only by Indians, who soaked away their physical ills in the hot pool, and supplied their primitive wants from the produce of their gardens, aided by the fruits of the palm, the mesquite and other native vegetation. Perhaps it is best barely to refer to the snakes, caterpillars and other animal food which gave a relish to this vegetarian diet. But this is all changed now, even the name. A little hamlet, called Palmdale—or sometimes Palm Springs—clusters around the sulphur spring, the few Indians who remain are crowded to the outskirts, and the valley is occupied by vineyards and apricot orchards, which ripen their fruits long before any others in Southern California. The inhabitants are almost exclusively sufferers from lung troubles, who find life in this warm and dry atmosphere. The altitude is but 500 feet above sea level, and the climate is charming in winter, but in summer the place is an oven. The natural vegetation is abundant and varied, and I know of no place where a botanist could spend a fortnight of his winter vacation in California amidst a more novel and interesting flora.

Some three miles up the valley from the springs a cluster of a few houses and orchards bears the enticing name of "The Garden of Eden." Opposite comes down a cañon, from which the Garden is watered. An Indian named Andreas used to live at its mouth, and from him it was called Andreas' cañon. Up it ran a difficult trail, leading to nowhere. Perhaps three miles, or it may be more or less, for the distance is a guess at this length of time, this trail crossed over a low ridge of the mountain to avoid the narrow gorge through which the stream at that point flows, and just above it came to an end, under a cliff on the left bank. The slope at its foot was covered with *Ayenia pusilla* L., the only place where I have seen this plant growing. Here we sat down

by the cool stream and ate our lunch, and then turning to an examination of the cliff, gathered, among other things, the type of the fern of which I am writing. This was in March, 1881, and I was just beginning my acquaintance with the desert flora. Almost every plant was unknown to me, so that my overloaded press could contain but a scanty gathering of any one species. I saw that the fern was new to me, but had no thought that it would prove so to better informed students, and so made no exception in its favor. The few specimens gathered were sent to Mr. Davenport, who described and figured them in the *Bulletin of the Torrey Club*, 8:61. In April of the next year I revisited the place, confidently expecting to secure a good supply of the new fern, but without succeeding in finding a single specimen. I have never been there since, nor, I am confident, has any other botanist. I hope others may not be deterred by my disappointment, and may be more fortunate. As an aid to such an one I will remind him that the fern has a considerable general resemblance to *Notholaena Parryi*, which is very abundant in that region; but it is readily distinguished on close examination.

Cheilanthes fibrillosa grew at the opposite, or western, base of the same mountain, which faces the San Jacinto Plains, and not far from the present little town of Florida. Here a road followed up the San Jacinto river for some miles, finally leaving it and climbing the mountain side to Strawberry Valley. I am told, for I have not revisited the place, that at present the road does not leave the river at the same point as it did in June, 1882, when this fern was collected. But not far—less than a mile—above the point where it then began its ascent, I happened on some tufts of a fern, growing among the boulders which strew the dry bed of the river, which proved to be the type of the present species. This collection, too, was very scanty. The late Mr. William Stout was much interested in the *Fendleri-myriophylla* group of *Cheilanthes*, and had requested me to send him anything belonging to it. So whenever I saw any ferns of this group I was accustomed to gather a specimen or two for my correspondent. By the end of the season I had gotten together a considerable representation from different places, and sent the whole lot to Mr. Stout. After his death they came into the hands of Mr. Davenport, who described the San Jacinto specimen as the type of a new variety of *C. lanuginosa* Nutt. (*Torrey Bull.*, 12:21). In the third edition of "Our Native Ferns," Dr. Underwood published it as a

species, giving it Mr. Davenport's provisional herbarium name.

It would be very gratifying to all lovers of ferns if these two, perhaps the rarest in North American herbaria, were rediscovered. But the places of their growth are visited by botanists seldom, and then hurriedly; should any have the opportunity of making a more thorough search, these notes will enable them to find the exact original stations. That a plant should be found in a single limited area is by no means common in Southern California, and notably in the desert region. Indeed the localization of plants is one of the marked features of the desert flora. One is very apt to find in each of the neighboring cañons, presenting, apparently, exactly the same environment, a plant or two which he may be unable to find in the others, or, even, may never see again. Possibly a very thorough knowledge of the desert might prove that this localization is less real than it appears to the casual botanist; but this knowledge no one has. In my own explorations there are not a few plants which I have seen but once, and in one small area. I have collected *Notholana tenera* in two places, finding at both a very scanty growth; one of these places I several times revisited, but without again finding the fern, although searched for. Another instance which comes to my mind is of a cucurbit which years ago my good friend, Mr. W. G. Wright, and I found in another little cañon of the same San Jacinto Mountain, and which has since been described as *Brandegea parviflora* Watson. I can go to the exact rock-cliff where it grew, and have been there several times since, at the right time of the year, and have searched the cañon from end to end, and not a sign of it was to be found; nor has it been rediscovered elsewhere, and only the scanty types represent this excellent species in herbaria. Like instances could be multiplied readily.

A CORRECTION.—In THE FERN BULLETIN for April, 1900, I described a supposed peculiarity in the period of growth of *Polypodium Californicum*; namely, that at low altitudes it grew in winter and rested in summer, while at high altitudes the periods of growth and resting were reversed. It is a pity to have to give up such a beautiful example of the adaptation of a plant to its environment; but a little more knowledge makes this necessary. For it happens that the summer-growing fern of the high mountains is not *P. Californicum* at all, but the widespread *P. vulgare*. It was many years since I had seen this little fern in its rare mountain haunts, and as no one suspected that *P. vulgare* grew within

500 miles of us, I had, carelessly, I confess, taken it for a small form of *P. Californicum*.

This summer, at last, I had an opportunity of gathering it again. A few fronds were sent to Mr. Gilbert, and his request for the reason why it was labeled *P. Californicum* caused a more careful examination, when he proved to be right in considering it good *P. vulgare*. The fronds are 2-4 inches tall, and rather thick in texture, so that the venation is not always readily apparent; they are rather intermediate between the species and the variety *occidentale* of Northern California. Perhaps some might include them in Mr. Maxon's *P. hesperium*. The real growth-habit, then, of these two Polypodies is, that *P. Californicum*, a species of lower altitudes, probably not extending more than 3,500-4,000 feet above sea level, vegetates during the rainy season, drying off and resting during summer. *P. vulgare*, on the contrary, growing at 6,000-8,000 feet altitude, vegetates in summer, and hibernates under the snow-banks of winter. The first is very abundant with us; the latter, seemingly, very rare.

TWO NEW FERN LISTS.—I.

BY GEORGE E. DAVENPORT.

THE "Ferns and Fern Allies of North America, North of Mexico," by William R. Maxon, calls for something more than an ordinary notice, as, emanating as it does from the Smithsonian Institution, with the apparent endorsement of the National Museum, it may be said to have the prestige of a semi-national character, and this from a national point of view is much to be regretted, as it represents the extremest views of the so-called modern reform movement, which is not likely to become permanently established either in this country or abroad. It is therefore to be seriously challenged, as I believe that nothing is more certain than that the nomenclatorial principles which it exploits will not be accepted by the great majority of fern students. This cannot very well be otherwise, as the whole superstructure rests upon the insecure foundation of a false assumption which claims for the *specific appellation alone, instead of the first correct generic and specific combination*, the authority of a name.

In Mr. Maxon's list the whole treatment has been carried out along the lines laid down by Dr. Underwood in the sixth edition of his "Manual" (1900), and, as the list may be said to reflect the

views of that author, whatever criticism is offered here will apply equally to both publications.

The treatment of species and varieties is especially open to severe criticism, there being too much of a disposition to recognize the deplorable tendency among certain writers to individualize plants and multiply species needlessly. For example, in the ferns alone, of the 196 so-called species enumerated, at least twenty (20), if not more, are not valid species in the same sense as *Polypodium vulgare*, or as recognized by a majority of the best authorities.

It should be stated here for Mr. Maxon's benefit that Mr. Gilbert has accepted several of these questionable species, so that, perhaps, it may appear to be, at least in some cases, a mere matter of opinion; but this much is certain, the characters on which such specific recognition rests are not such as are generally accepted by the best workers as fundamentally and structurally distinct, but are such as are dependent on size, texture, compounding of the lamina, and other characters that can be shown to be extremely variable and wholly unreliable.

No better example could be adduced to illustrate specific differences than the case of *Botrychium ternatum* and *B. Virginianum*. These two species are structurally and fundamentally distinct in every way, and there are no intergradient forms between them, so that it is impossible ever to mistake one for the other. *B. matricariaefolium* and *B. lanceolatum* may not always be as distinct structurally, but fundamentally their vernation and spores are as distinct as those of *ternatum* and *Virginianum*; but in the group of forms that make up the aggregate of *B. ternatum* the vernation and spores are identical, as I have previously shown, and there are no fundamental characters whatever to justify the extreme segregation into which Prantl and Dr. Underwood have attempted to separate the group.

In the "Ophioglossaceæ" the views of Dr. Underwood are adopted without any reservations, and some twelve (12) or thirteen (13), at the most, valid species are raised to twenty-three (23) on characters scarcely of varietal importance! *Ophioglossum arenarium* E. G. Britton is a mere form of *O. vulgatum*, and is now so regarded by Mr. Clute and Mr. Gilbert; and so of *O. Alaskanum* (E. G. Britton), and *Engelmanni* Prantl, which was previously named var. *mucronatum* by Butler. *O. Californicum*

Prantl is distinct from *vulgatum*, but it remains to be proven whether it is distinct from *O. nudicaule* or not.

Botrychium tenebrosum A. A. Eaton was long ago correctly determined by Prof. D. C. Eaton as depauperate *matricariæfolium* from specimens collected in Vermont by Mr. Pringle in 1874, and figured in my Monograph on *B. simplex* (Figures 32 to 38) in 1877. *B. neglectum* Wood is a mere synonym for *B. matricariæfolium* R. Br., and is represented abroad by Milde's var. *subintegra*.

As for the much abused *B. ternatum* group, having several times published my own views it is needless for me to repeat them here, but the following extracts from a recent communication from the eminent European pteridologist, Dr. H. Christ, may not be inapplicable:

"I share in your way of seeing that all these forms belong to one type—*ternatum*. After an elaborate study of all the specimens in my possession, I find that there are few characters salient enough to establish *varieties*, still less *sub-species*, with the exception of *lunarioides*, which appears to me to claim such a place by the reniform segments and the stalk so slightly raised of fruiting part which give to the plant a very different aspect. * * * But it seems to me absolutely erroneous to style these forms 'species.' One who does this has no idea of what is a species in the vegetable kingdom."

Cheilanthes amœna A. A. Eaton is an unfortunate synonym for *C. Californica*, as originally determined by Prof. D. C. Eaton, and it would have been better left unpublished. *Pellæa occidentalis* Rydberg is apparently a depauperate alpine form of *P. atropurpurea*, as I judge from a personal examination of the type specimens in the National Museum.

In the treatment of varieties Mr. Maxon is strangely inconsistent, recognizing some inconsequential forms and wholly ignoring others of importance. Even his own *Dennstædtia punctilobula cristata*—a form which has maintained itself in Nature for the past twenty-five years, and this year has reasserted itself vigorously in my garden—is dropped altogether, while he appears to be sadly at sea over his *Polypodium vulgare deceptum*, for which it is to be hoped he will be able to find a satisfactory resting place before many more synonyms are tacked on to it. *Dryopteris Goldiana celsa* Palmer has been correctly referred to "*Clin-tonianum*" by Dr. Underwood, judging from the specimens which I have seen. The authority for "*Aspidium spinulosum* var.

dilatatum" should be Hornemann, 1827, and not Hooker, 1830.

Under the treatment of genera old landmarks disappear so rapidly that one becomes dizzy in trying to find the way without them. The displacement of century-honored names is carried out in some cases on the flimsiest of pretexts, as in the case of Swartz's *Anemia*, which is better left undisturbed, there being no evidence to show that Bernhardt's *Ornithopteris* was published first. Its appearance in Swartz's "Index" is not such evidence, as its presence there might be accounted for in other ways. In fact Dr. Underwood himself has supplied a reasonable explanation by admitting the existence of intervals of time between the printing of portions of Swartz's "Synopsis" and "Index."

The substitution of *Struthiopteris* for *Lomaria*, *Matteuccia* for *Struthiopteris*, *Filix* for *Cystopteris*, *Tectaria* and *Phanerophlebia* for *Aspidium*, as well as several other similar changes, is to be seriously challenged, but it would require more space than the limits of this criticism will permit of to enter into any discussion here. I apprehend, however, that few fern students will be willing to adopt such changes.

It is not a pleasing task to make adverse criticisms. One would much rather utter words of praise; especially when, as in the present instance, one holds an author in high esteem. The work itself has been admirably done, and, if judged solely from the author's point of view, may be considered as a successful and praiseworthy performance. The citations bear evidence of painstaking efforts to insure accuracy, and the author is to be congratulated on the success of this portion of his work. It is, however, much to be regretted that he should have followed so closely the lead of another instead of giving to us more original work, and it is quite certain that he has just missed, at the very beginning of his promising career, a splendid opportunity to secure recognition on a permanent basis.

Following the BULLETIN's suggestion of last summer, I studied below the ground and found a root of *Dryopteris intermedia* that was as large and tough as that of a shrub. The curious revelation to me was its miniature fac-simile to the frond itself. In using the knife I had split it for some inches. Doubtless other seekers have discovered the same appearances, but they were new, not only to me, but to all who examined the root as it was on exhibition on my porch.—F. L. Knowlton, Danville, Vt.

THE GENUS *EQUISETUM* WITH REFERENCE TO THE NORTH AMERICAN SPECIES.

BY ALVAH A. EATON,

NINTH PAPER.

E. LITORALE Kuhl.

RHIZOME shining dark brown, with narrow central cavity at times bearing a few tubercles. Stems prostrate or ascending, a few inches to three feet high, fertile and sterile alike, finely roughened with cross-walls of silica, as in *palustre*, with 6-18 rounded angles and shallow grooves, naked or variously branched, but always ending in a slender naked tip. Lower sheaths appressed or becoming open when dry, longer than broad, partly or wholly brown, the upper more often colored like the stem, the uppermost, in fertile stems, bell-shaped. Leaves rounded on the back, slightly angled below. Teeth narrow lanceolate, often joined in twos or threes by the very narrow white margins, dark brown, sharply pointed, on the largest sheaths often acquiring a median groove in drying. Stomata many, irregularly scattered in the grooves, as broad as long. The central cavity occupies $\frac{1}{2}$ - $\frac{2}{3}$ the diameter of the stem, the carinal present, surrounded with a ring of yellowish cells, the vallicular usually present, only occasionally one being absent. Branches when present dark green, the darkest of our *Equiseta*, scattered or 10-15 in a dense verticil, simple or rarely branched, confined to the lower internodes or oftener to the middle ones, $\frac{1}{6}$ in. long, 3-5 wing-angled, with fine cross bands of flint, ascending or erect, seldom arched as in *fluviatile*, lower internode about equaling the stem sheath, solid or with small central cavity, the inner portion bordered with yellowish cells. Fruit spikes yellowish, raised on a fleshy peduncle, the sporophylls not separating as in other species, apparently never perfecting spores, sterile stems or even branches often ending in a small, sessile abortive spikelet.

A very polymorphous and puzzling species, presenting a maze of forms not approximated by any other. At times it grows in dense patches on the sandy river border, 2-3 feet high, with few or no branches (*gracile*); again it is found in a wetter, slightly muddy place with *fluviatile* and simulates that species by becoming densely verticillate (*elatus*); now it grows in rather loose wet sand and bears a large spike (*humile*), and now

in patches in hard gravel with a small terminal spike (*vulgare*). Outlying plants of this will be prostrate or ascending like *arvense decumbens* (*arvensiformis*), and where there is little competition and sufficient moisture, in recently disturbed sand it bears a few twiggy branches at a decumbent base, while the long erect portion is naked (*humile*?). Finally at the very uppermost river border, in gravel with a little humus, shaded by overhanging trees or bushes, it is tall, erect, branched from near the base to near the summit, the branches regularly decreasing from the middle each way, the most beautiful form of the species and next to *sylvaticum* the finest *Equisetum* we have.

Now it is *arvense* in appearance, now *fluviatile*, now *palustre*; but widely as the extremes differ in appearance a most abundant supply of intergrades is usually at hand, showing conclusively they are the result of environment alone.

It can be distinguished from *arvense* with a lens, as the angles of the branches are less prominently winged and the siliceous coat is disposed in cross-bands, while in the other species it is in punctiform dots. In section the stem is different from *arvense* in wanting the yellowish line separating the two cylinders, and in having one about the carinal canal, which *arvense* oftener want. From any form of *fluviatile* with which it is liable to be confounded it may be distinguished by its more open sheaths, broader margined cohering to the and narrower central and vallicular canals. The branches are thicker walled or solid, more winged, usually 3 or 4 angled, while in those of *fluviatile* the walls are thinner, the angles lower, mostly five or more. The ribs of the dried plants are flat and often appear as if grooved because of the transparency of the bast. The sheaths are also looser, through shrinkage of the stem. I find that by breaking the stems of fresh plants just beneath the node, those of *fluviatile* show a somewhat star-like central opening, while those of *litorale* are larger and round. This is the easiest test I have yet found.

The section illustrated in Britton & Brown (Fig. 81) is doubtless of *fluviatile*, as it has no vallicular cavities, which are always represented in *litorale*, at least in the American plant, but are absent in *fluviatile* except in large stems or basal sections. Milde says that the vallicular cavities fail, but he figures them, and my European specimens possess them.

HABITAT.

This species, though abundant where found at all, is quite sporadic and rare. It was first discovered at St. Petersburg about 1845, but its range has been extended over Europe and eastern America from about 49–60° N. lat. It has not yet been reported from Asia. In America, so far as available material shows, it extends from Pennsylvania to Maine and Ontario west to Minnesota. Reported from Washington and British Columbia, but Suksdorf's and Macoun's plants so labeled are *fluviatile*. It is probably much more common than is suspected, as it grows with and greatly resembles *fluviatile*, for which the general collector will take it.

Along the lower course of the Merrimac river for miles it is an abundant and characteristic plant, and under the name of "joint-grass" is cut for hay. It is the only species which I have seen growing wherever influenced by salt water, it growing on the border of marshes at Salisbury, Mass.

HYBRIDITY.

This species is commonly regarded to be a hybrid between *arvense* and *fluviatile*, as it stands exactly between them in structure and habit, and the fruit is abortive. If so it would not be a difficult thing to prove, for *Equisetum prothalli* being dioecious, the almost insurmountable obstacles in the way of fern hybridization would be evaded. It would be a good subject for undergraduate investigation. Milde at first considered it to be a hybrid, but later receded from his position and left the matter in doubt. Buysson, in his monograph, strongly combats the idea. I am not aware that any American author has ever written on the subject. If a hybrid, its range should be co-extensive with the range of its parents, which does not appear to be a fact. The species of *arvense* ripen at least a month before those of *fluviatile*, and from its habit they would not be expected to germinate where *fluviatile* could fertilize it. But the prothalli are quite persistent, at least female ones, so difference in time of fruiting would not necessarily debar hybridity, and in seasons of low water the prothalli might grow in quite low places till fertilized and rooted. Milde offers as an objection, the fact that new plants from spores are comparatively rare in this genus, it being a good example of the universal fact that plants easily multiplied by other methods than by seed get to depend on that method and

a corresponding decline in fructifying power results. The argument need not be of great weight except as proving that an inherent tendency makes it impossible, for given a single plant and time and great regions may be overrun. I think the fact that the plant is sporadic, but abundant where found, would support the hybrid theory. An argument on the other side is the fact that the plant never grows where the soil gets dry, although as a matter of fact it does grow a little higher up the shore than *fluviatile*, a sandy reef being entirely populated with it, while on the low ground all around, the latter predominates. If *arvense* were a parent it might be expected to grow with that species. This in fact it appears to do in Europe, though always in damp fields, but I have not seen it here save where *arvense* is in abnormally low positions. But *arvense* itself will grow and fruit in water, so a hybrid between it and a water species might be expected to have a preference for dampness. At present it is an open question, but those holding the hybrid theory are certainly wrong in saying the burden of proof rests with those who reject it, for hybridity being contrary to the natural mode of propagation, it certainly cannot appertain to those who hold to the natural method to prove that it is violated.

Seabrook, N. H.

[In the next number, the varieties of this species will be discussed. Sets illustrating this and *fluviatile* will be distributed late in the year. Address Mr. Eaton for further information —Ed.]

DRYOPTERIS SIMULATA IN CENTRAL NEW YORK.

By H. D. HOUSE.

THE existence of a station for *D. simulata* in Central New York has long been suspected, for in 1891 Miss Nellie Myrick collected near Oneida some specimens which later were identified by Davenport as this species. Unfortunately Miss Myrick was unable to tell the exact location of the place where she collected the fern and the station has not since been found.

While collecting near Sylvan Beach, nine miles north of Oneida and on Oneida Lake, a few days ago, I found what I believed to be *D. simulata*, and specimens sent to Mr. Maxon proved my surmise correct. The fern grows abundantly here in

open places in marshes or swamps, which at certain times of the year are more or less inundated. The soil is sandy, overlaid by a thick accumulation of rich leaf mould. Judging from the character of the growth in the surrounding swamps, the clearings were also at one time covered by a growth of small birches, poplars, red maples and other swamp loving shrubs and small trees. The most important plant associates of *D. simulata* here are *Woodwardia Virginica*, *Dryopteris thelypteris*, *Athyrium filix-fœmina*, *Osmunda cinnamomea*, *Carex folliculata*, and *Decodon verticillatus*.

There are many swamps of similar conditions throughout central New York and I believe that a careful search will reveal *D. simulata* in many of them.

Oneida, N. Y.

FAIRY RINGS FORMED BY OSMUNDA.

MR. T. C. BUCHHEISTER recently called my attention to the fact that the various species of *Osmunda* not only produce their fronds in circular crowns, but that the different plants are themselves arranged in larger circles. In a recent trip of several miles through a country where these ferns grow in abundance, I improved the opportunity to put this matter to the test and was surprised to find that the plants are rarely disposed in any other form where the conditions permit them to develop naturally. Walking into a thicket of the plummy fronds, one finds himself surrounded by a fairly regular circle of the plants. So here we have another form of the "fairy ring," if it is permissible to associate such tall and sturdy plants with the fairies.

Dr. Robinson, in *Rhodora*, has noted similar fairy rings in *Lycopodium inundatum* and explains them upon the supposition that the different plants move outward from the centre in search of fresh soil and new food supplies, and so eventually form the circles. This explanation, owing to the way in which the ferns grow, would seem scarcely to answer for the *Osmunda* circles. It is more likely that each is the progeny of a single plant which has given off branches from time to time, all of which moved outward from the place of origin. It was noted that a line through the plants in a clump made an oval rather than circular figure, and it is conjectured that the original plant started at the broad end of this oval and grew along the major axis directly across the centre

of the figure. If this be the correct solution, one has only to consider how very slowly the *Osmundas* move onward each year to realize the great age of a large ring. A hundred years is a very low estimate of the time needed to form one.—Willard N. Clute.

OUR WESTERN WOODWARDIA.

BY ALVAH A. EATON.

HAVING become familiar with the plant known as *Woodwardia radicans* during my sojourn in California and through cultivation since, I was quite forcibly struck by the difference in aspect when compared with veritable specimens of the species from Maderia; especially so as Brewer and Watson (*Bot. Cal.* II, 344) remark that the only difference is in the presence or absence of the scaly bud, although Eaton (*Ferns of N. A.* II, 117 *et seq.*) touches slightly on other points of variance.

Doubtless many who have analyzed this plant have noticed that the venation does not agree with that of the section *Euwoodwardia*, but rather of *Anchistea*, being almost identical in plan with *W. Virginica*. My studies on this subject have convinced me that in spite of a superficial resemblance, those authors, who are neither few nor second rate, that consider our plant distinct, are in the right. The first available name appears to be *spinulosa* of Martens and Galeotti, recently taken up by Mr. Maxon (*Proc. Nat. Mus.* XIII, 4. 4, '01). Some of the points of difference are:

First. The venation, *radicans* having one, and usually two rows of meshes outside the fructiferous row, and the veins terminate at the margin, while *spinulosa* has fewer veins, all free beyond the fruit except occasionally at the base of the segment, and usually excurrent into a pellucid awn, whence the name.

Second. The characteristic bud of *radicans*, which gives it its name, has never been seen on our plant.

Third. The appearance of the fronds is different, *radicans* being relatively broader with tips of pinnae and segments very long acuminate, the latter separated by a very narrow linear sinus, while the segments of *spinulosa* are obtuse and separated by a broad, rounded sinus.

Fourth. *Radicans* appears to be glabrous, while *spinulosa* is provided with resinous glands to which dust and debris freely

adhere, thus often giving a puberulent appearance. Strangely enough I find no mention of this character in any available book. This does not exhaust the differences, but is sufficient, it appears to me, to demonstrate the specific value of our plant.

During the past year Mr. Joseph C. Love, of Berkeley, Cal., has sent me fronds taken from a plant found wild but now in cultivation, which have such a striking appearance that they deserve to be noted. I have called it *forma ramosa*.

The pinnæ are narrower than in the type, the segments being shorter and very broadly decurrent, the cutting gradually decreasing in depth until some of the upper pinnæ are simply crenate. Nearly all the pinnæ are forked at the tip, most are again forked and a few cristate. The main rachis is divided for about the upper fourth of the frond, the two divisions repeatedly forked and the ultimate segments ending in from two to ten points. I am informed by Mr. Chas. T. Drury that a *cristate* form of *radicans* is known, but not a *ramose* one.

Seabrook, N. H.

THOMAS MEEHAN.

FEW men in any age have led a busier life than Mr. Thomas Meehan, whose portrait appears elsewhere in this issue.

Other interests have constantly obliged botany to take second place with him, and yet in the latter province alone he has won honors enough to satisfy half a dozen botanists. It is, therefore, with much pleasure that a short sketch of his life is presented.

Mr. Meehan was born in London, March 21, 1826. His father was head gardener for an English gentleman and the son came naturally by his love for plant studies. His leaning in this direction was shown at the early age of 14, when he published his first scientific paper on the sensitive nature of the stamens of *Portulacca*. This and other botanical work secured for him admission to Kew Gardens as a student. A few years later he started for the New World, larding in New York on his twenty-second birthday. Shortly after he was engaged as gardener in the famous Bartram Gardens of Philadelphia and afterward came to have entire charge of them. In 1853 he started in the nursery business for himself. This he still continues near Philadelphia in conjunction with his sons.

He is a member of many scientific societies, among which may be mentioned the American Philosophical Society and the American Association for the Advancement of Science. He has been Vice-President of the Philadelphia Academy of Science for a quarter of a century and has also found time to represent his ward in the Common Council for nearly as long. During this term of service he has secured for the city no less than twenty-three new parks. He has also served on the local school board for nearly twenty-five years.

To our readers, Mr. Meehan is probably best known through his botanical writings, the titles of which are said to number at least a thousand. Half a century ago he published "The Handbook of Ornamental Trees," and some time later began his valuable "Flowers and Ferns of the United States," which comprises several volumes and is still continued as a department of that excellent botanical journal, *Meehans' Monthly*. The colored plates and the text which accompanies them are patterns of botanical excellence.

Although belonging so much to the public by reason of his works, Mr. Meehan is very averse to publicity and it was with much difficulty that his friends secured the likeness which we present. He has frequently refused permission to publish his portrait, but his consenting to sit for a portrait in oil to be hung in the rooms of the Philadelphia Academy of Science, of which he has so long been an officer, was the entering wedge, and from the painting the picture here produced was made. Mr. Meehan is still in good health, though he has passed his seventy-fifth year.

TWO FERN ALLIES IN CENTRAL NEW YORK.

BY J. V. HABERER, M. D.

ON October 5th last, while collecting Botrychia in the vicinity of Utica, I was surprised to find a colony of *Lycopodium inundatum* on the north side of the Mohawk, in Deerfield, Oneida county, N. Y. The locality is one of sandy hills, mounds and depressions, with a number of springs. The vegetation is very scanty, consisting mostly of ferns, mosses and lichens. The plants inhabited the depressions, and though quite numerous were confined to a small area. I was at once impressed with the favorable conditions for the existence of the species; the flow from the springs and the autumn rains, inundating, so to speak,

and converting each hole or depression into a miniature sandy bog. The plant has been hitherto overlooked in this region.

In this connection it is worthy of record, that on the flat of the stream formed by the springs above mentioned, I first detected the new variety *Botrychium ternatum Oneidense*, so well described and aptly named by Mr. B. D. Gilbert. In a meadow close by it was my good fortune to find several plants of *Centaurea Jacea* L., new to the Mohawk Valley.

Equisetum litorale was first found in Central New York by the late lamented Father Wibbe, on the banks of the Oswego river at Minetto, and subsequently by Mr. F. V. Coville, at Oneida Lake, on the banks of Fish creek, near its mouth. For several seasons I have observed an *Equisetum* on the southerly shores of Oneida Lake, in the town of Lenox, Madison county, which is *the type* and also the variety *gracile* of Milde.

This very slender, beautiful plant is there very common, growing in immense patches on the gravelly shores, *not* in sand, and probably deserves further investigation.

Utica, N. Y.

A NEW STATION FOR ASPLENIUM EBENOIDES.

BY G. A. WOOLSON.

SOONER or later the persistent botanist finds what he is looking for. *Asplenium ebenoides* has weighed heavily on my mind for several years. Late one afternoon last fall I discovered the proper environment for the hybrid. July 25th I had the pleasure of locating this unique production of Nature's handiwork on a limestone ridge in Proctor, Vermont, making, I believe, the third New England station. My find consisted of two small plants in a pocket of a rock. Just sixty-eight feet south of this pocket Dr. H. H. Swift found another and much finer plant on a grassy slope. The two in the pocket were young, with fronds varying from three to five inches; the other was evidently a long established plant, several of the fronds measuring ten inches. A six-inch member was rooting at the apex after the manner of one of its probable progenitors. *Asplenium ebenum* and *Camptosorus rhizophyllus* were in abundance. Five feet from the pocket was a tangled mass of both; single specimens of each were much nearer. Another tangle of *Asplenium ebenum* and *Camptosorus rhizophyllus* was but three and a half feet from the big plant; single specimens anywhere from six inches to two feet.

A thorough investigation of the locality convinces me that there is not another specimen lurking in the vicinity. Skeptics to the theory of hybridity can assuredly find food for thought in the environment described. Nature does not tell us all she knows, but teaches by hints and half truths. Is it not a trifle presumptuous to deny her the ability of producing naturally that which can be done artificially?

Pittsford Mills, Vt.

GENERIC AND SPECIFIC NAMES.

IN the matter of specific names, I fully agree with Mr. George E. Davenport and other conservative men in adopting the views of Dr. Asa Gray, our most distinguished North American botanist. His idea was that, while a plant can have but one name, this name must consist of both a generic and specific to be complete. A specific alone carries with it no special significance, as it may be used in several different genera and be valid in each. Take for instance the specific name *gracilis*. We have *Pellaea gracilis*, *Gymnogramma gracilis*, *Cyathea gracilis* and so on. The combination of generic and specific, therefore, being necessary to constitute a real name, it follows that we must use this combination entire as it was originally published by the author who first put the two together. If we use the generic name of one author and the specific of another (unless the former author has used it also), we are simply making a hybrid name. Thus Linnæus, either misunderstanding the true character of his own genera, or else mistaking the character of the fern, called a certain species *Polypodium platyneuron*. Thirty-six years later Aiton, seeing the true nature of the species, transferred it to *Asplenium* and called it *A. ebenum*; and as that was the first time it had been published as an *Asplenium* we must use the full name given it by Aiton, and not hybridize it by using his generic and going back to Linnæus for his specific. This was Dr. Gray's method of dealing with nomenclature, and it is certainly the common sense way. It does away with the fad of searching through obscure books to find an earlier specific than the one in use—a proceeding which has resulted in such endless confusion and instability in the science. It also prevents such meaningless repetitions as *Phegopteris Phegopteris* and *Scolopendrium Scolopendrium*.—B. D. Gilbert in "North American Pteridophytes."

THE EARLIEST FERN.

THE question has been asked, which is our earliest fern, and it was answered a few years ago in the BULLETIN that it was *Cystopteris fragilis*; but I have reason to doubt this. A few years ago I had some *Pellaea gracilis* sent me, and in want of a limestone ledge I planted it on the mossy roots of an old willow with the walking-fern. Both are doing well without lime, and the *Pellaea* is spreading rapidly. I think I have here the earliest and the latest together. On April 10th the little croziers of the *Pellaea* were unrolling, even in the shade on the north side of a fence, while *Cystopteris fragilis* in a rockery in the garden had not shown signs of life. On May 1 the *Pellaea* was fully expanded, while the *Cystopteris* was only partly unrolled and this, too, in spite of its more favorable position. Has anyone else noticed *Pellaea gracilis* in early spring?—A. A. Eaton.

NEW WAY OF GROWING FERNS.

IN India, according to *Indian Gardening*, they have an interesting way of growing ferns on the outside of porous earthenware vessels. The vessels may be of many shapes, but are best made bottle-shaped, with strong necks by which to hang them up. The vessel is first plastered roughly with mortar, and when this dries the rootstocks of the ferns are bound upon it with fine wire. The vessel is then filled with water, and this oozing out constantly keeps the ferns in proper condition. Apparently all the other sustenance the plant needs is taken from the mortar and the air. Growers of American ferns may find this method worth exploiting. Maiden-hair ferns are recommended for growing thus, but any fern would probably do, especially those with running rootstocks like the common polypody. A process akin to this has long been in use on this side for growing fern prothalli. Essentially it is simply an unglazed flower pot with the hole in the bottom corked and filled with water. The little fern plants soon begin to sprout on the moist outer surface of the pot, and grow thriftily until large enough to be planted by themselves, being always kept properly moist by the water which oozes through the sides of the pot.—W. N. C.

THE RANGE OF POLYPODIUM CALIFORNICUM.

IN a small package of ferns recently gathered in Costa Rica, brought me by a friend, there were two fronds of *Polypodium Californicum* Kaulf. They were found growing in soil not far from San Jose, C. R. So far as I have been able to discover, this species has not previously been found south of Lower California. Neither Hooker, Baker nor Underwood mentions any other country for it except California. Shimek says nothing about it in his "Ferns of Nicaragua;" Baker does not mention it in his "Biologia Centrali-Americana," which deals especially with Costa Rican ferns. So, unless there has been some publication of it subsequent to the issue of Baker's "New Ferns," which I am not aware of, this find establishes a new range for it. It has been collected in Lower California and Guadaloupe by Dr. Edward Palmer and T. S. Brandegee. But that was its southern limit up to the present time. One of these fronds is normal in size, form and venation. The other is smaller, having only two pairs of pinnæ below the trifid apex, but with the same venation, and a single row of sori on each side of the costa.—*B. D. Gilbert.*

In parts of New York State, the Maiden-hair (*Adiantum pedatum*) instead of the bracken, is called umbrella brake.—*W. N. C.*

Mr. T. C. Buchheister notes that in a recent trip to the Catskill Mountains of New York, he found numerous forking fronds of *Dicksonia pilosiuscula*. It would be interesting to know whether the fact that the stipe of this fern usually gives off a secondary rootstock has any bearing upon this frequent forking of the blade.

In 1894 or 1895 I found a small clump of about ten plants of *Dryopteris Boottii* in a thicket full of *D. simulata* and other treasures, near Glen Burnie, Maryland. Two years later I found two or three plants by the side of a road nearly twenty miles to the north of the first locality. This adds two more localities to the one mentioned by Mr. Palmer in the January BULLETIN.—*C. E. Waters.*

EDITORIAL.

THE NEW VOLUME

It is a rare, perhaps an unprecedented thing for a journal devoted to a single family of plants, to continue uninterrupted publication for a decade.

THE FERN BULLETIN, however, has nearly reached this distinction and in honor of the event, the tenth volume, which begins with the next number, will be something quite out of the ordinary. In the first place, the number of pages will be increased one-third in order to accommodate the vast and ever increasing amount of original notes on ferns. In the past year we have frequently been obliged to disappoint both contributors and readers by withholding valuable articles for want of room. With these extra pages we now hope to keep up with the subject. The series of portraits of people prominent in fern study will be continued and a new department added in which will be given an index to all current literature relating to ferns. These things, however, are all in the line of expected improvements. For this special volume we are preparing things of still greater interest which will be announced in good time. Suffice to say now that nearly every fern student of prominence in the entire world will contribute to it.

* *

THE NEW PRICE

The advancing of the price of this journal to seventy-five cents a year is only tentative. If it is found that fern students prefer a smaller number of pages at fifty cents, the increased price and size will be abandoned after a year's trial, but the volume for 1902 will cost seventy-five cents and, we are convinced, will be worth it to every student of ferns in America. We hope that none of our subscribers will feel that the advanced cost renders them unable to receive it longer. With this issue we mail a bill for subscription to all who are not paid in advance for 1902, and respectfully call attention to the note relative to the payment of such subscriptions accompanying it.

NOTES.

—The index to the present volume will be issued with the number for January next.

—On page 60 of this volume, seventh line from the bottom, the word *Athrrium* should be *Athyrium*.

—Owing to a pressure of other matter the article "Helps for the Beginner" was crowded out of this issue. The series will be resumed in the next issue.

—The editor expects to spend the Autumn and early Winter in New Orleans. Correspondents who do not receive replies to their communications as promptly as usual will understand why they are delayed.

—It is a curious fact that several species of ferns secrete nectar, our common bracken among the number. In a recent issue of *Science* Prof. F. E. Lloyd gives an account of the bracken's nectaries, and in the *American Botanist* for August a summary of the same article is given.

—Volume V, Number 2 of the "Natural History Bulletin of the University of Iowa" contains a list of Iowa Pteridophyta by B. Shimek, showing forty-one species to grow in the State. In the introductory matter the author has some very pertinent observations on present-day nomenclature. In his list he follows conservative botanists, adopting *Nephrodium*, *Polystichum*, *Athyrium*, etc.

BOOK NEWS.

A little volume entitled "First Studies in Plant Life" * by Prof. Atkinson has just been issued by Ginn & Co. It is intended as an introduction to structural and physiological botany and is written in a style that will appeal to the beginner, although there are a goodly number of technical words. These are perhaps necessary, but at the same time are rather difficult for the young student to grasp alone. With a teacher, to explain the hard parts, even the child in the lower grades ought to have no difficulty in understanding and becoming interested in the wonderful processes of plant life described. The author has very properly left many questions to

* First Studies of Plant Life, by George Francis Atkinson. Boston: Ginn & Co., 1901. 8vo. pp. 261.

be answered by the pupil who must make investigations and experiments for himself. The section of the book devoted to "Life Stories of the Plants" will interest many who are not beginners in this branch of botany.

The appearance of Mr. Gilbert's "North American Pteridophytes"* is another indication of the trend of fern study at present. It is the first list to pay special attention to forms less prominent than species, and the author is to be commended for the large number he has here brought together. No less than four hundred and forty-two species and forms of Ferns and Fern Allies are catalogued from North America north of Mexico. These have their distribution given, are consecutively numbered and form a very handy check-list that any fern collector will be glad to possess. The author very sensibly adopts a conservative and recognizable nomenclature, though he gives a considerable number of synonyms, especially for species for which there has recently been proposed a change of name. In adopting *Nephrodium* instead of *Aspidium* or *Dryopteris* a long step has been taken in putting our nomenclature in harmony with that of the rest of the world. The only adverse criticism of the list which the reviewer can make is that the author has not distinguished clearly enough between forms and sub-species, or "varieties." For instance it seems scarcely correct to give the same rank to *Equisetum arvense memorosum* that is accorded *Nephrodium cristatum Clintonianum*. Nearly one-half of the pamphlet is occupied by an appendix in which are described a number of forms and varieties in *Equisetum*, *Isoetes*, *Athyrium*, *Nephrodium* and others. It is probable that this publication will form the foundation for a very extended study of the variation in ferns in America.

*Working-list of North American Pteridophytes, by B. D. Gilbert. L. C. Childs & Son, Utica, N. Y.: 1901, pp. 40. 25c.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—While the Executive Council have nominated two members for each office in the chapter, it is not intended to limit voting to this list. If any one wishes to vote for other members he may do so, and should they receive a majority of the ballots cast, they would be declared elected.

—Some confusion having arisen among members as to whom annual dues shall be paid, it seems desirable to state that all such dues should be remitted to the Treasurer, Mr. James A. Graves, Susquehanna, Pa. If members will bear this in mind and act upon it accordingly, it will simplify the duties of both Secretary and Treasurer, and enable them not only to keep their records separate, but with much less trouble than when part of the dues are sent to each.

—Two species of *Lycopodium* are offered for distribution among Chapter members this quarter. Mr. B. D. Gilbert offers to send a fruited specimen of *L. tristachyum* Pursh (*L. chamæcyparissus* A. Br.), collected from the only station yet reported in New York State; and Mr. William R. Maxon offers excellent specimens of *L. Chapmani* Underw. (*L. adpressum* (Chapm.) Lloyd & Underw.), collected near Washington, D. C. Stamps to the amount of four cents should accompany requests in both cases.

New Members.

Since July new members have been admitted to the Chapter as follows: Miss Mary D. James, Cochocton, Ohio; Mrs. A. Russell Stevenson, Schenectady, N. Y.; Mrs. James D. Paxton, St. Paul, Minn.; Miss Margaretta Paxton, Princeton, N. J.; Miss A. F. Taft, 79 Waterman street, Providence, R. I.; Mr. George M. Smith, 165 Hope street, Providence, R. I., and Mrs. A. Vincent Osmun, Storrs, Conn. Mr. C. E. Waters' address is now changed to Johns Hopkins University, Baltimore; that of Mr. H. P. Walker to 1,031 Temple Court, New York, and that of Mrs. M. L. Stevens to 16 Columbia street, Brookline, Mass.

Election of Officers.

The ninth annual election of officers of the Linnæan Fern Chapter is hereby announced. The Executive Council submits the following list of candidates: *For President*, Mr. B. D. Gilbert, Clayville, N. Y.; Mr. James H. Ferris, Joliet, Ill. *For Vice-President*, Mr. George E. Davenport, Medford, Mass.; Mr. C. T. Druery, Acton, London, England. *For Secretary*, Mr. C. F. Saunders, Philadelphia, Pa.; Miss Harriet Wheeler, Chatham, N. Y. *For Treasurer*, Mr. James A. Graves, Susquehanna, Pa.; Mr. Charles L. Pollard, Washington, D. C.

All members whose dues are paid to November first next are entitled to vote and are earnestly requested to avail themselves of the privilege. Ballots may be sent by postal card from October first to November first to Dr. Dana W. Fellows, Y. M. C. A. Building, Portland, Maine, who has been appointed Judge of Elections.

THE BOTANICAL GAZETTE

Edited by John M. Coulter, Professor and Head of the Department of Botany in the University of Chicago, and Charles R. Barnes, Professor of Plant Physiology in the University of Chicago. Published monthly, with illustrations. Subscription price, \$4.00 a year in the United States; foreign, \$4.50; single copies, 50 cents.

Devoted to botany in its widest sense. For more than twenty years it has been the representative American journal of botany, containing contributions from the leading botanists of America and Europe. In addition to the formal papers presenting the results of research, current information and discussion are given in the editorials, and in the departments of Current Literature, Open Letters, Notes for Students, and Notes and News.

SAMPLE COPIES SENT ON APPLICATION TO
THE UNIVERSITY OF CHICAGO PRESS, CHICAGO, ILL.

SEA SHELLS BY MAIL

Twenty-five different kinds for 25 cents stamps or coin. If you want to start a collection now is the time to commence. I have as FINE shells as there is and can furnish any amount and at prices that you can afford to buy. Everyone is pleased with them. Try this small order. Shells for wire jewelry and tools for beginners. Send for list. Agents wanted.

J. F. POWELL, Waukegan, Ill.

THE TOWN BEAUTIFUL

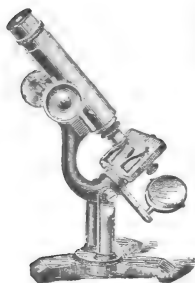
Practical suggestions in Landscape
Gardening for improving Streets,
Parks, School and Station Grounds,
Cemeteries, etc., are given in

PARK AND CEMETERY AND LANDSCAPE GARDENING

Published Monthly. Subscription,
One Year, \$1.00. Single Copy, 10
cents * * * * *

R. J. HAIGHT, Publisher,

324 Dearborn Street, CHICAGO.



Edward Pennock

3609 WOODLAND AVENUE
(Opposite University of Pennsylvania)
PHILADELPHIA

IMPORTING OPTICIAN

FINE MICROSCOPES, NEW AND SECOND-
HAND, MY LIFE-LONG BUSINESS

... SEND FOR BARGAIN LIST ...
of Second Hand Microscopes, Cameras and Accessories.

Admirable Two-Lens POCKET MAGNIFIER by Mail for 40c.

EFFECTIVE SECTION-INSTRUMENT BY MAIL FOR \$1.10

My "WATER-WHITE" CANADA BALSAM is unique: *almost absolutely colorless.* (Is filtered through paper, of course.) Superior to any other—*compare it.* Quotations made on any quantity, large or small.

THE AMERICAN FERN BOOK

Our Ferns in Their Haunts

By WILLARD N. CLUTE

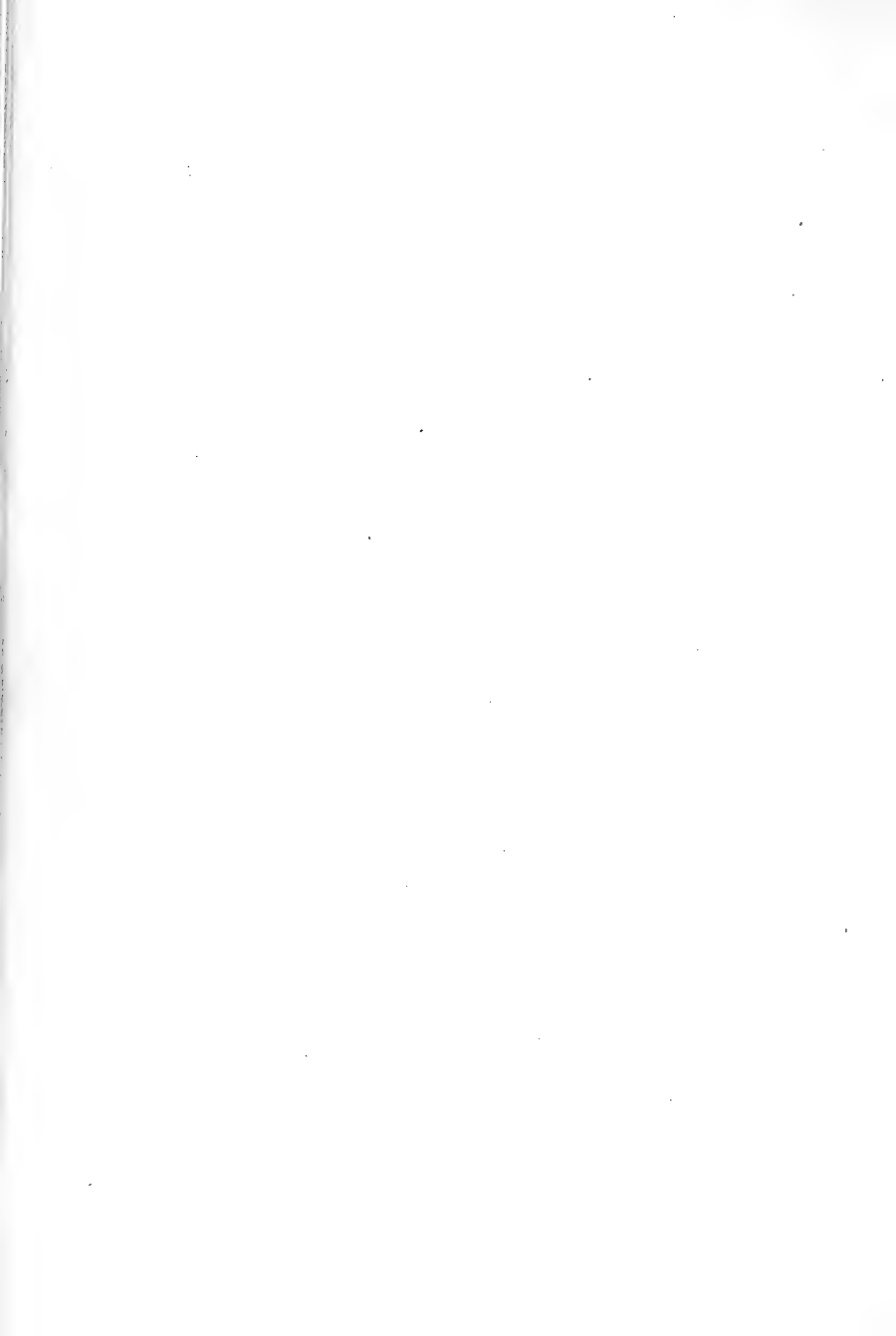
340 Pages of Text and 250 Illustrations

THE only illustrated key to the genera ever published, Checklist of all the species and varieties east of the Rocky Mountains and north of the Gulf States with synonymy. All the common names given, and the haunts and habits of our native species correctly described. No other book is so fully illustrated or contains so many pages of text.

Price \$2.15 net; \$2.35 postpaid

Money refunded if book is not satisfactory. Send for a copy.

Address, W. N. CLUTE & CO., Binghamton, N.Y.

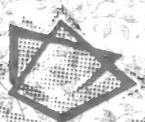




New York Botanical Garden Library



3 5185 00328 4161



CoLibri
COVER SYSTEM

Made in Italy

09-10 MIN



8 032919 990075

www.colibrisystem.com

